ELECTRICAL TIMES

THURSDAY
12 OCT.
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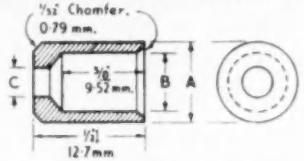

SIZE	A	B	C
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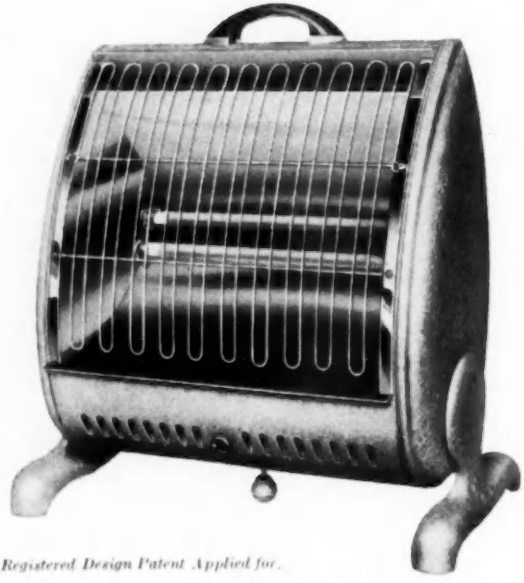

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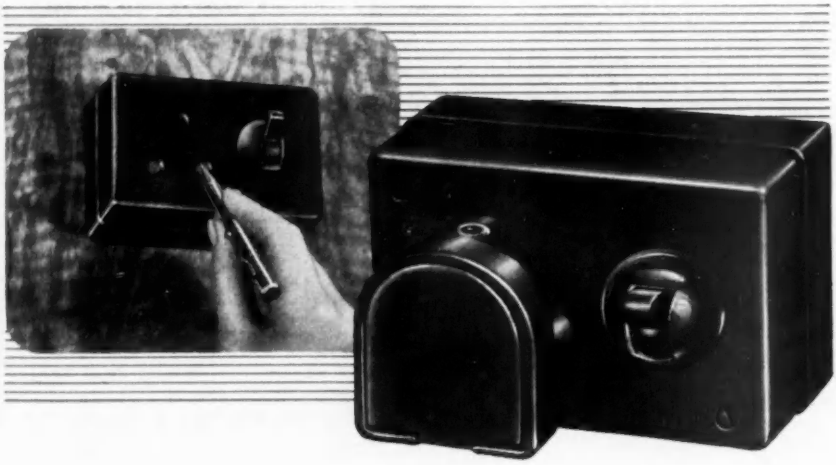

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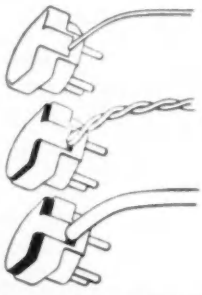

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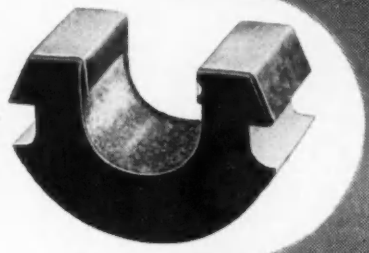

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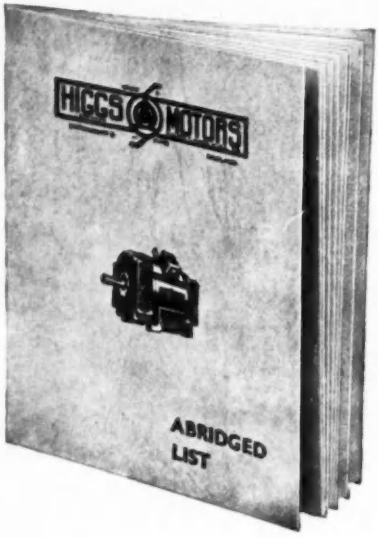

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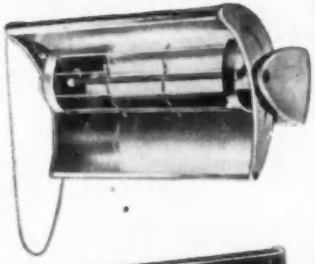

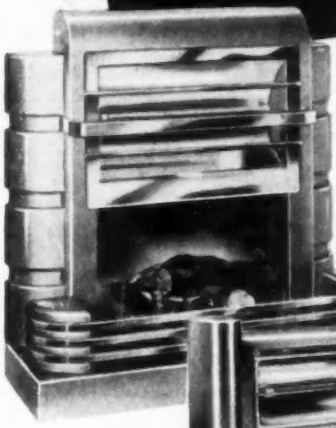

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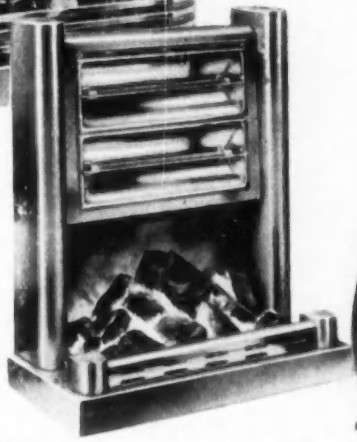

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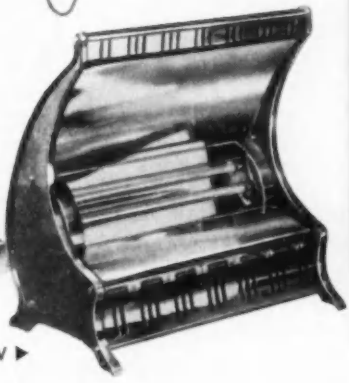

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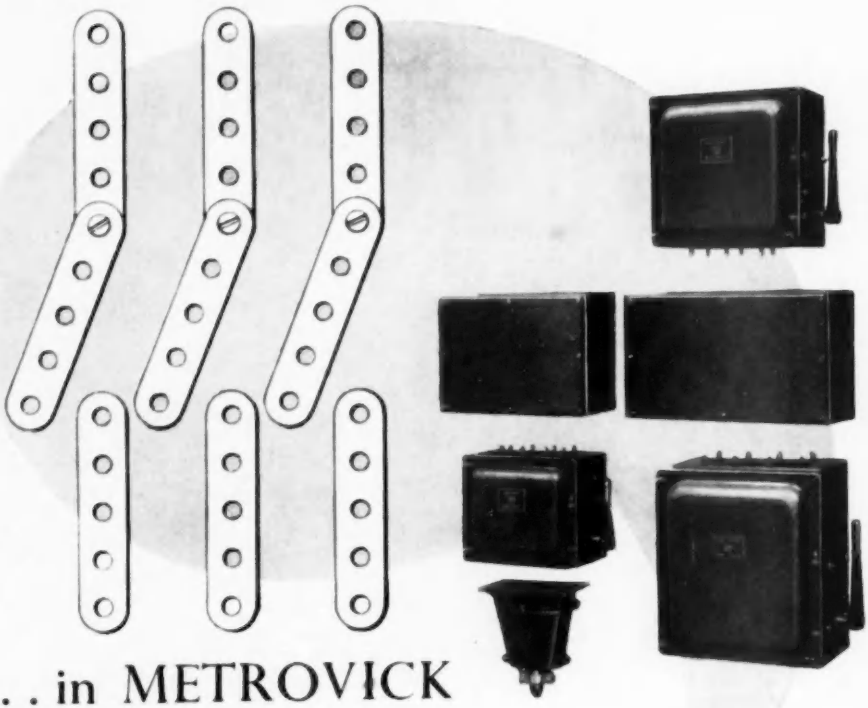

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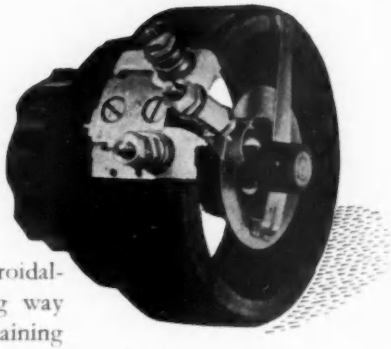

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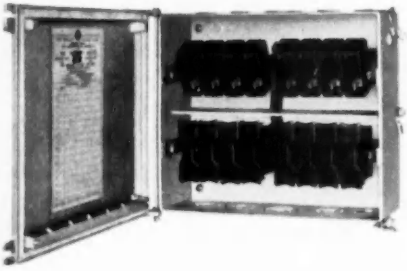

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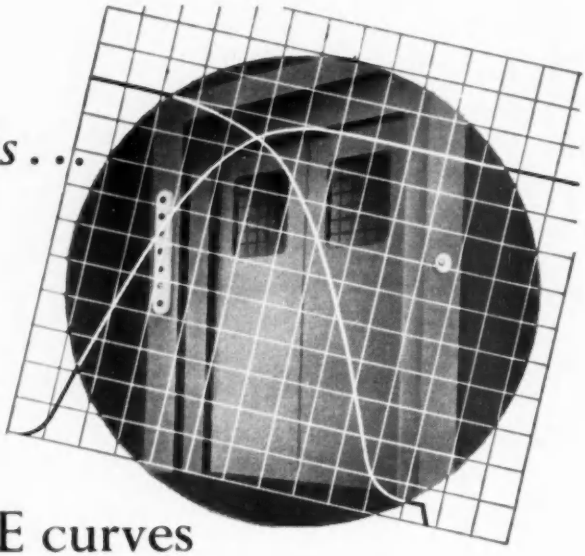

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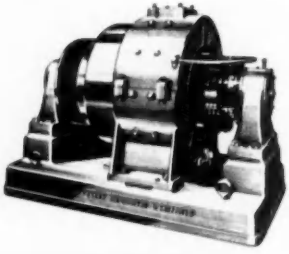

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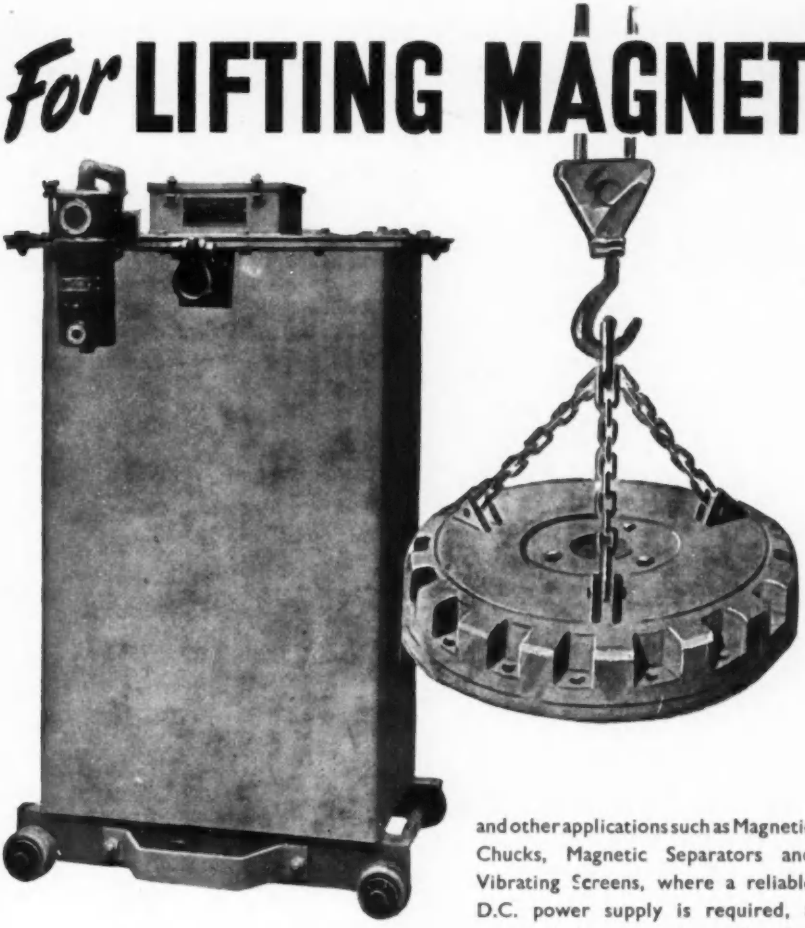

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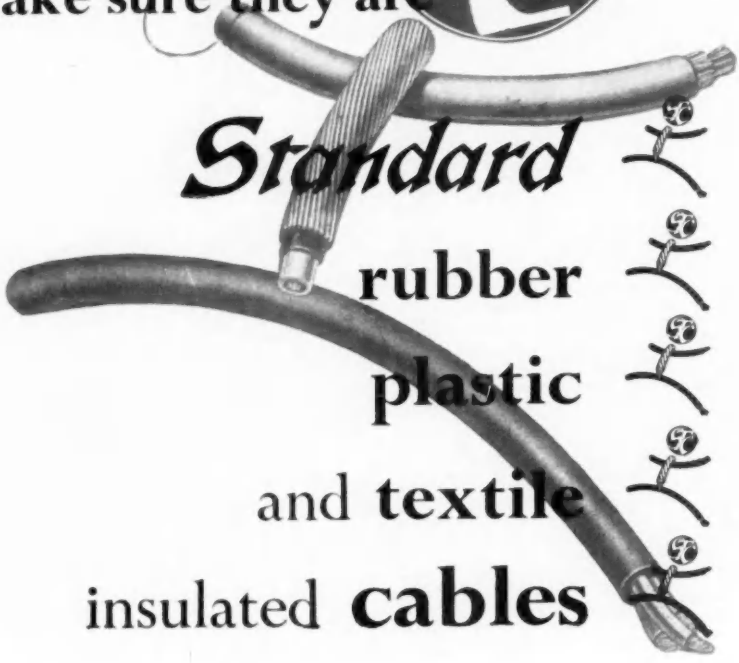

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THE MODERN FRACTIONAL H.P. MOTOR

L.D.C. motors, built to N.E.M.A. dimensions, are being supplied in increasing quantities to the Canadian and home markets. (C.S.A. approval No. 3516).

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Associated Companies:
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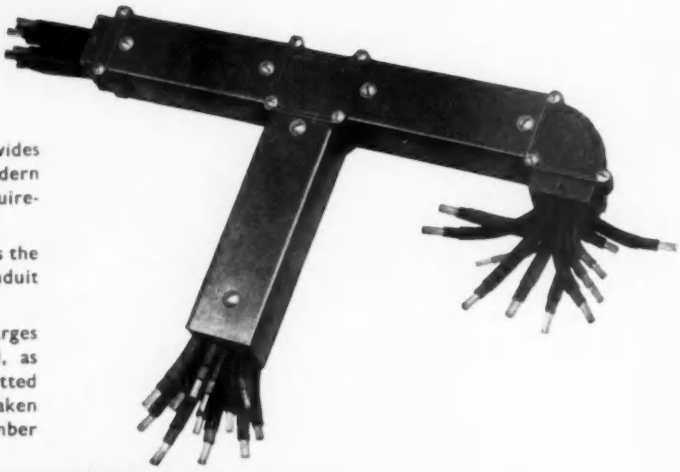
Save UP TO 50% ON YOUR COST OF ELECTRICAL INSTALLATION



- Cable Trunking provides the answer for all modern electrical installation requirements.
- One Cable Trunk takes the place of multiple conduit runs.
- Installation labour charges are considerably reduced, as one Cable Trunk can be fitted in a fraction of the time taken to install an equivalent number of conduit tubes.

- We manufacture a fitting for practically every purpose, together with a full range of accessories.
- Miles of our Cable Trunking are already in use in Factories, Power Stations and Public Buildings, etc.
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Cable Trunking with covers removed to show bunching of cables.

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No. 2

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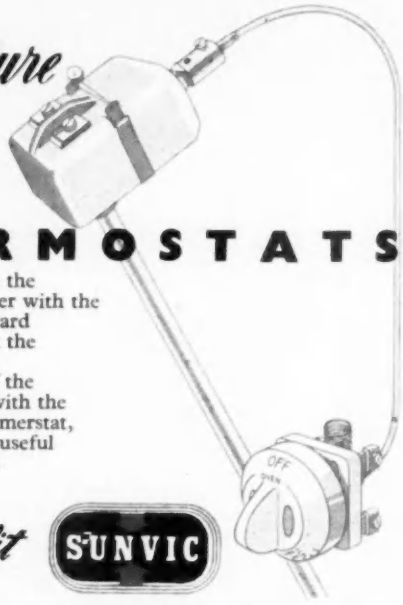

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Better feel sure—better fit

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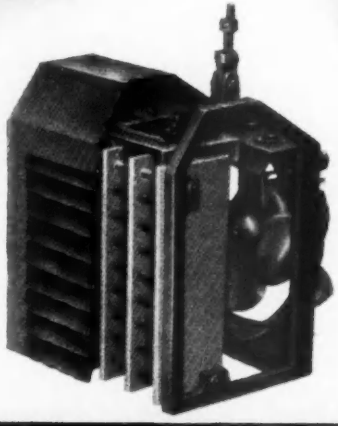
Made in 3 sizes 3, 5 and 10 K.W.



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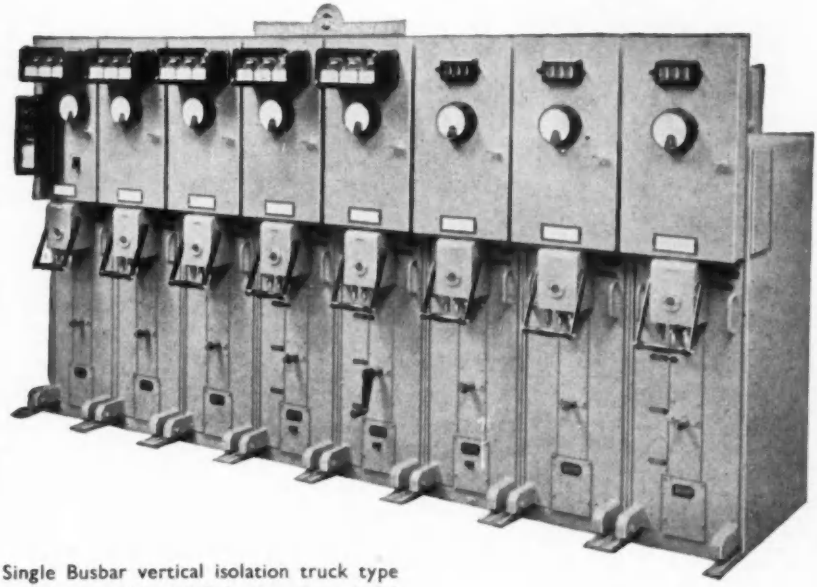

Single Busbar vertical isolation truck type switchgear with A.S.T.A. Certificated Oil Circuit Breakers for 6.6 or 11kV. Normal current ratings up to 800 amp, 150 MVA or 1600 amp, 250 MVA.

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Amplivox Earphone containing coil (actual size)

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There are 250 feet of BICC 49 S.W.G. enamelled winding wire on each coil, yet the total weight, including Polystyrene bobbin, is only ·76 grammes.

For whatever type of coil you make, you'll find every winding wire you need in the range manufactured by BICC. Let us send you further information in Publication No. 267V.

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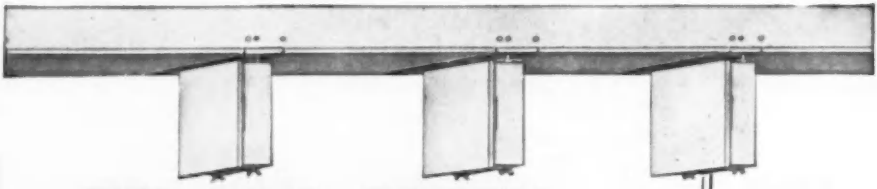


THE B.B.T. SYSTEM

The B.B.T. Bus-Bar Trunking System is considered by many to be the best method of distributing Electric Power in Machine Shops and other indoor locations where power is required at points not too widely separated.

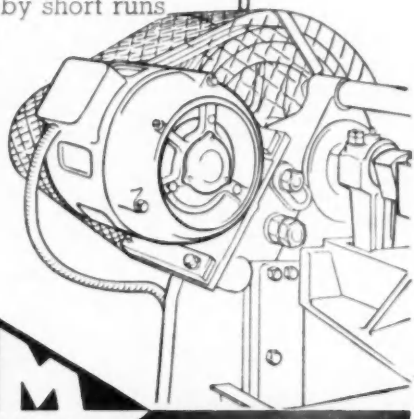
The B.B.T. System consists of bare copper Bus-Bars housed in a steel duct. Tapping points are provided at intervals of two feet along the duct.

Fused Tapping Boxes can be plugged into these as required, and the load connected by short runs of cable in conduit.

B.B.T. Bus-Bar Trunking is made in standard 12 ft. lengths. These can be erected in a variety of ways to suit individual requirements.

This ideal system is reasonable in first cost, cheap to install, and capable of alteration with all speed, with the minimum loss of production hours.

Write for Catalogue BBT102



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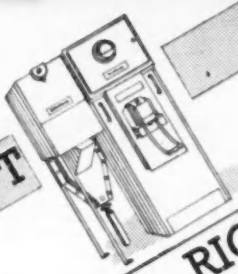
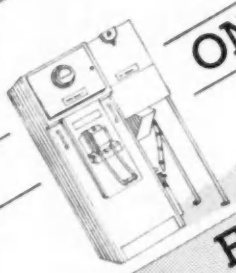
ONE ON THE LEFT

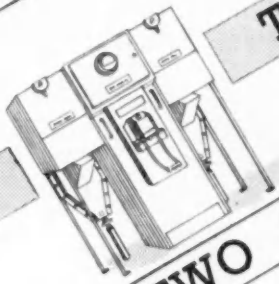


ONE ON THE RIGHT

TWO

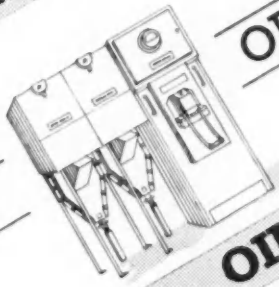


ONE EACH SIDE



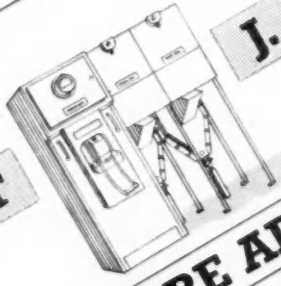
OR TWO ON THE

ON THE LEFT



J. & P. OIL IMMERSED

RIGHT



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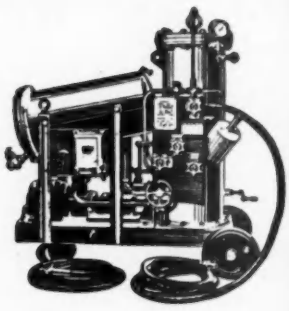
The insulating value of used transformer and switch oils by one passage through the Metafilter is raised to a higher break-down voltage than the new oil.
The plant is purely mechanical and extremely simple in operation.



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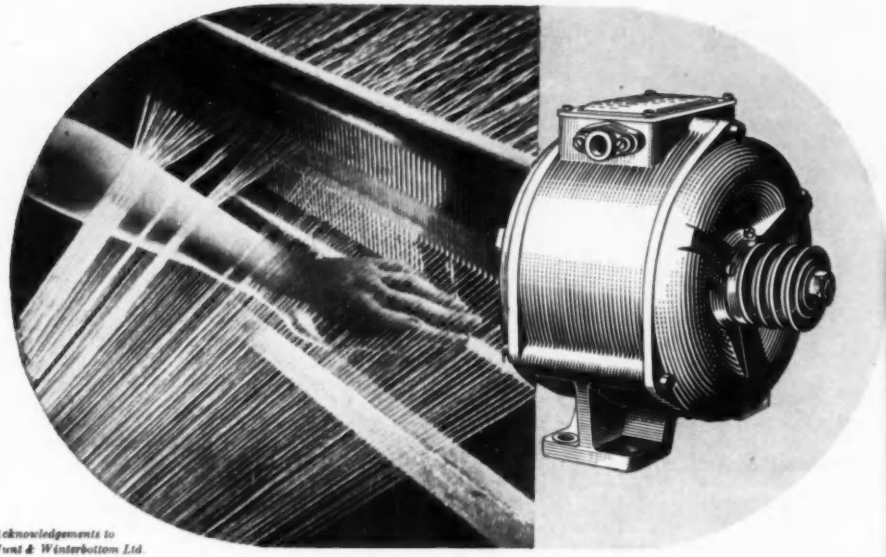

Acknowledgements to Hunt & Winterbottom Ltd.

Skill of human hand and eye
... aided by complex yet precise machines
... which, in their turn depend
on clean, smooth unfaltering power
... Brush, who pioneered individual
drives in the early days of shafting and
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that are most compact, economical and
suited to any task or situation.

The Brush range of AC motors includes sizes from 1 to 1500 h.p. slipring or squirrel cage. The Brush DC range covers standard requirements enabling the most economic size to be selected for any given duty.

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When we read this meter we see more than Kilowatt-hours — we see Streetly-moulding-years, with the pointer nearing 17. By which we mean that . . .

We started moulding meter covers for this Company in 1932. Ever since we have handled the job to their satisfaction. That is **EXPERIENCE.**

Sixteen years satisfaction . . . yes, but we deliver thousands of cases a month and that Company depend upon our regularity as much as upon quality and dimensional accuracy. That is **RELIABILITY.**

The meter case as you see it is very different from the one we made in 1932. We are proud to be able to say that we have played our part in its evolution. That's what we mean by **SERVICE.**

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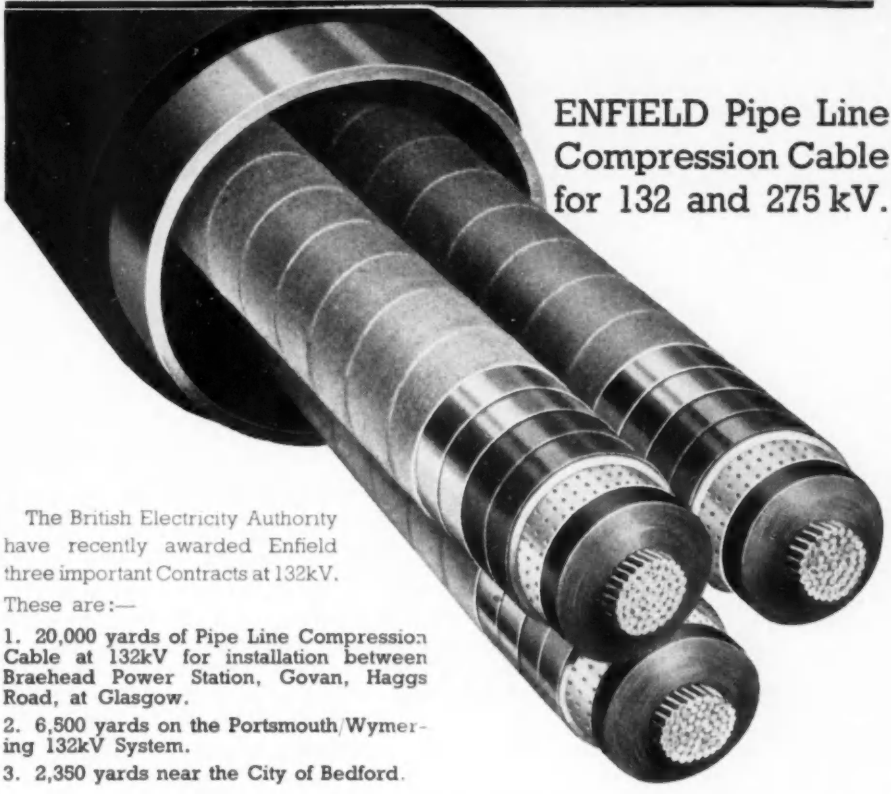

ENFIELD Pipe Line Compression Cable for 132 and 275 kV.

The British Electricity Authority have recently awarded Enfield three important Contracts at 132kV. These are:—

1. **20,000 yards of Pipe Line Compression Cable at 132kV for installation between Braehead Power Station, Govan, Haggs Road, at Glasgow.**
2. **6,500 yards on the Portsmouth/Wymering 132kV System.**
3. **2,350 yards near the City of Bedford.**

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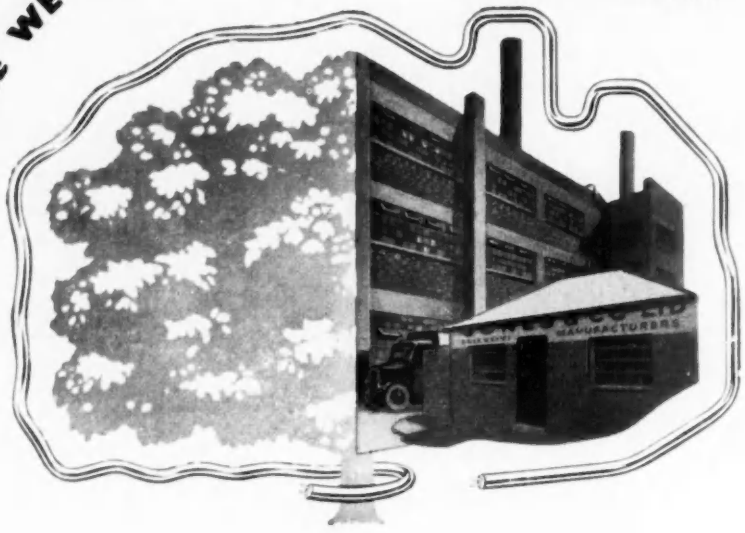
HERE WE GO ROUND THE MULBERRY BUSH



One of the virtues of " Pyrotenax " M.I. Cables, and an unusual one, is their pliability. They can be bent to follow the contours of any regular or irregular shaped object. There are many applications where this characteristic is of great value. For the wiring of machine tools for example. Or for fitting snugly round curves and in and around awkward corners in factories, power houses, buildings, ships etc. Any form of clip, saddle or clamping device—widely spaced—will hold them firmly in position. Once installed, " Pyrotenax " M.I. Cables require no maintenance and no renewals. In addition, they are fire resistant; unaffected by oil, water, suds, condensation, accidental overload or gross ill-usage.

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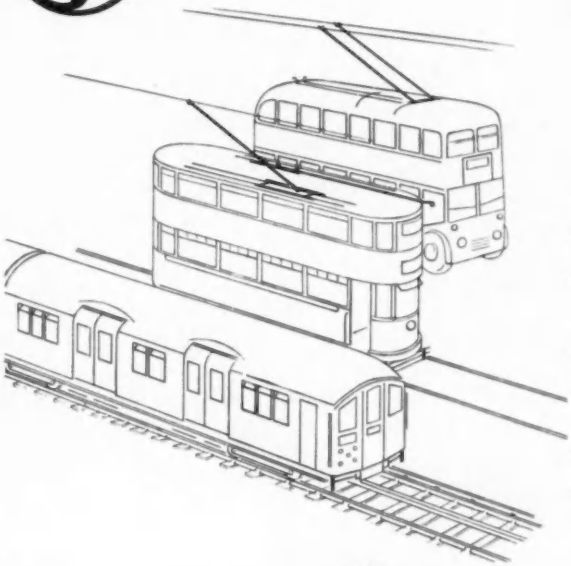
Electric Traction Equipment



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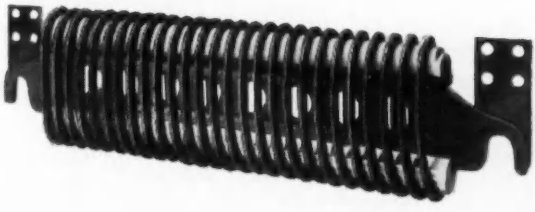
- Endwise-wound strip of liberal section and high specific resistance
- Mounted on steatite spacers.
- Will withstand heavy overloads and high operating temperatures.

BTH manufacture all types of electric equipment for traction purposes.



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THE BRITISH THOMSON-HOUSTON CO., LTD., RUGBY, ENGLAND

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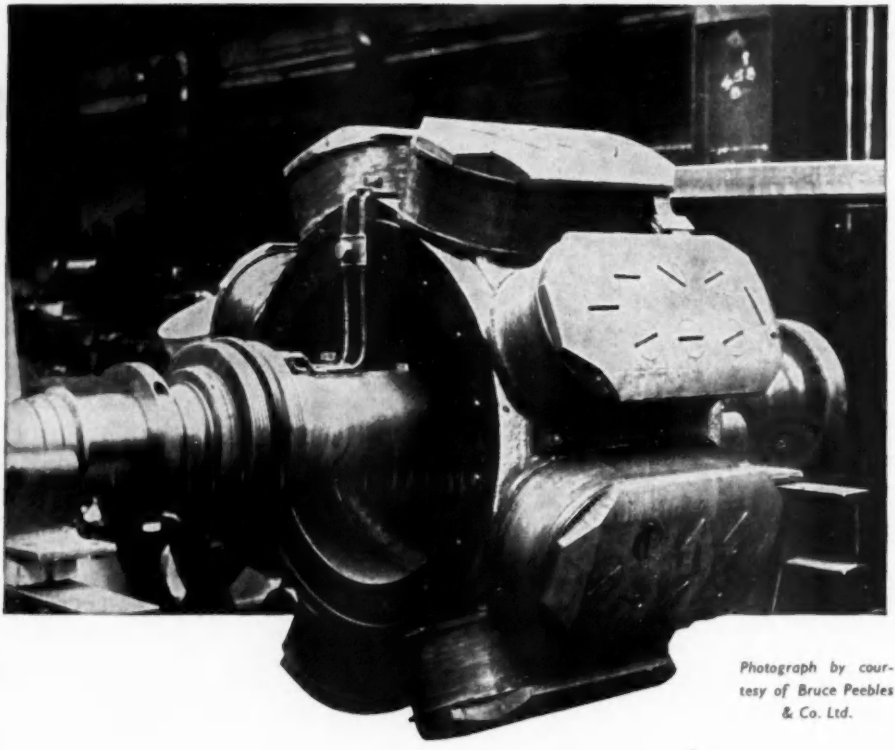

Photograph by courtesy of Bruce Peebles & Co. Ltd.

'Anacos' Copper used on a Magnet Wheel of a 500 K.W. Alternator for the Nostie Bridge Power Station of the Lochalsh project of the North of Scotland Hydro-Electric Board

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Incorporated in The London Electric Wire Company and Smiths, Limited
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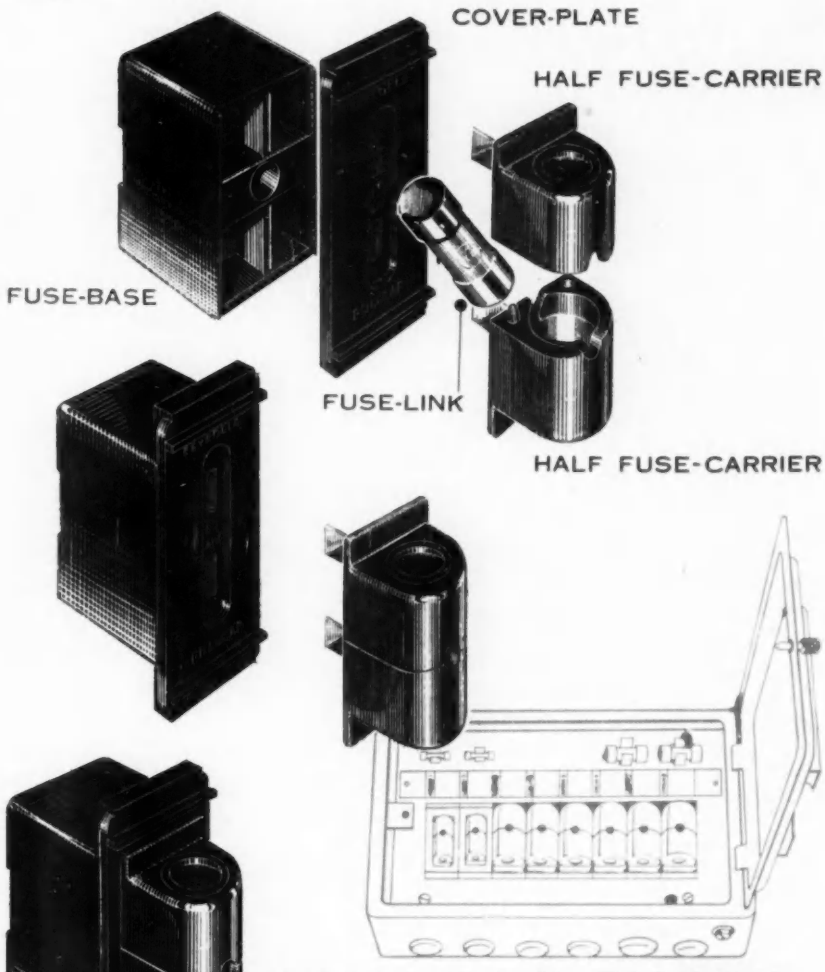
Caps off to Pullcap



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RATED AT 5, 15, 30 AND 60 AMPERES

TO B.S.88-CATEGORY OF DUTY 440 AC4

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HEBBURN CO. DURHAM ENGLAND

Solenoid operated 'BV' (6kV) and 'KC' (low voltage) switchboards at Stanlow Oil Refineries. *Reproduced by courtesy of Shell Refining & Marketing Co. Ltd.*

VITAL SUPPLIES are interdependent

Stanlow Oil Refinery.

Petroleum and electricity have this in common—they are both Vital Supplies of motive force for industry.

The increased demand for petrol and petroleum by-products is being met by the expansion of Shell refineries, particularly of their great refinery at Stanlow, Cheshire.

The choice of Ferguson Pailin Switchgear to control the internal light and power distribution system of this modern plant is a mark of confidence in its reliability under continuous service conditions.

'BV' Switch unit.

FERGUSON PAILIN LTD.

MEMBER OF THE AEI GROUP OF COMPANIES

Switchgear Specialists

MANCHESTER, 11. ENGLAND

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FULLER ELECTRICAL & MANFG. CO. LTD.

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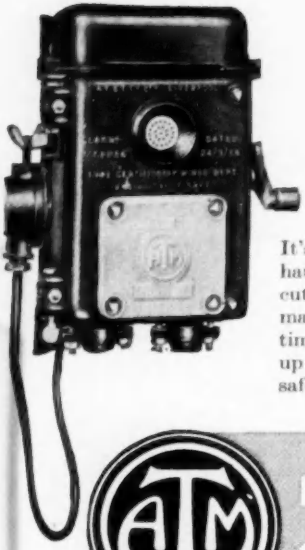

Put output UP

It's of little use increasing the output at the coal face unless hauling and winding is able to keep up with the rate of cutting. Remember that output UP the shaft is what matters — remember also that A.T.M. equipment is saving time and providing more winds per shift in many collieries up and down the country. For reliability, efficiency and safety specify

A.T.M. mine telephones and signalling equipment

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Extremely robust in construction these telephones have been granted the appropriate certificate by the Ministry of Fuel and Power. The ironclad wall mounting pattern (dustproof and weatherproof) has been specially designed for parallel operation and the number of telephones which can be connected depends upon line conditions. All connections are readily accessible for inspection.

Direct dialling between surface and underground telephones is possible through the A.T.M. Auto-exchange Coupling System (covered by British Mines Certificate No. T/TEL/68/1).

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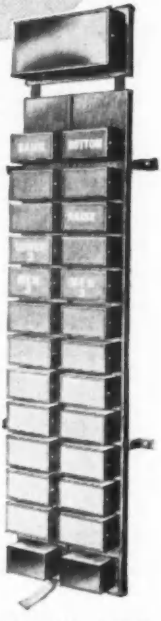
An electrically operated indicator which gives immediate visible and audible indication. Each signal appears in a separate glass panel (accompanied by the statutory audible signals) and the engineman has a precise and definite indication of the operation demanded from any level. Signals are non-accumulative but the cautionary signal "MEN-3" remains displayed throughout the wind.

The range of A.T.M. mine signalling equipment also includes certified bells for A.C. and D.C. units, transformers, armoured cable glands, cordless telephone switchboards, signal cancellers, etc. Write for further information.



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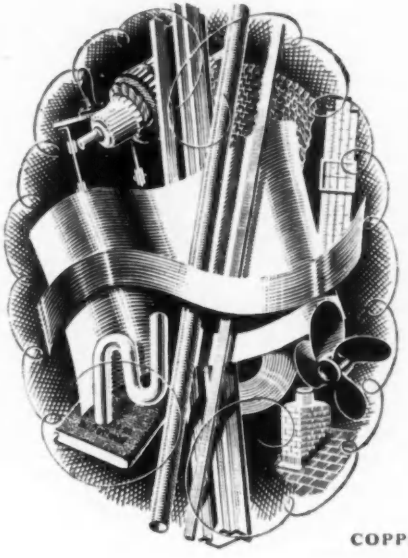

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ELECTRICAL TIMES

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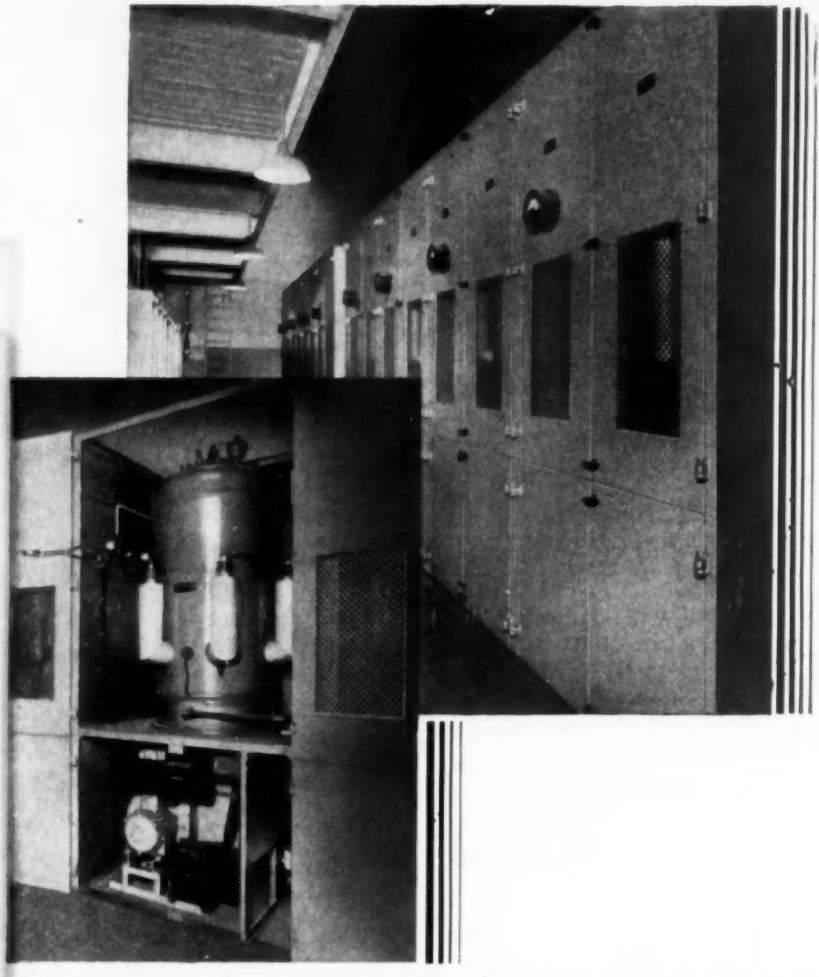

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Rectifiers

by G.E.C.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Editorial

QUIETENING THE DISQUIET

SOME few weeks ago we referred to the dissatisfaction which was still current in certain sections of the industry and reported an E.P.E.A. sectional resolution mentioning specifically the South Eastern Division. We are therefore pleased to hear that energetic measures are now being taken to allay this disquiet, and to provide reassurances to staff on such questions as redundancy. A meeting has been held with the E.P.E.A. at which, we understand, matters were frankly discussed and the Divisional Controller stated he would personally endeavour to revisit his staff as widely as possible in the near future. Under the impact of such measures, the bitterness of the past months already appears to be lightening, and will no doubt largely evaporate when a full and mutual understanding is reached. It should reduce the potential threat of plans made at headquarters without adequate regard to the personnel affected and remove that uncertainty, bred of insufficient personal contact, which has been one of the principal causes of the unrest.

TAX ON SAFETY

IT is the convenience and portability of the electric fire that leads to its abuse, and the figures of fatal accidents, from such causes as clothes catching fire, remain ominously high. By careful design danger can be reduced, but not averted, and there are signs that manufacturers are beginning to give greater attention to suitable guarding of the element, the most dangerous part of the structure. One maker, indeed, includes several additional features. Of necessity, such devices cost money, and other things being equal, a fully protected fire will cost more than an unprotected one. Unfortunately, this natural price differential is artificially increased by the high purchase tax. Not only does such a tax discourage manufacturers from introducing safety designs, but in addition, should a consumer wish to purchase such a fire, the Treasury sees that he pays dearly for safeguarding his family. This is not the first time we have criticised the unfortunate effects of the indiscriminate application of purchase tax. If, as seems inevitable, this impost is to become a permanent institution in our way of life, then the time is overdue when a complete revision of the tax should be undertaken to avoid such damaging influences, which not only are contrary to the nation's welfare, but are a danger to life itself.

AMPLIDYNAMICS

IN the last ten years or so, the rotating amplifier type of machine has increased in popularity at a rate which is reminiscent of its own response curve. Fostered during the war period, where its peculiar qualities rendered it invaluable for servo-mechanisms and the like, it is now finding wide application in industry. The word "amplidyne" is attaining such a widespread usage that, as in the case of "Thyratron," "Ignitron," "Megger" and "Nichrome"—to name only a few—one is apt to forget that it was coined to denote one particular manufacturer's product and has been adopted as a generic term. Further, it is not generally realised that the machines marketed under other names do not necessarily operate on exactly the same principles. Elsewhere in this issue we publish an article which, by differentiating between the *modus operandi* of the various types of rotating amplifier, should be of considerable interest to many engineers who have hitherto tended to take these machines for granted, and feel that they would like to become more intimately acquainted with their individual characteristics.

CONTRADICTION IN THERMS

ALTHOUGH the gas famine which London has been experiencing lately caused brisk business in electric kettles, its effect on cooker sales was really surprisingly small. Apart from one or two dealers who disposed of old cookers which had been practically written-off as unsaleable, there seems to have been little panic buying, even of breakfast cookers, although it is admitted that the cheaper types of breakfast cookers would have sold better if larger stocks had been instantly available. Frankly, we prefer matters that way. There is little satisfaction in beating an adversary whose hands are tied—it is far more satisfactory to beat them on equal ground, and the recent strike, if it has not done anything else, has at least tended to equalise the basis of competition. No longer can the gas industry claim that their cookers are "as good as electric cookers, but without power cuts," since it is difficult to imagine a power cut which lasts a fortnight. As we have repeatedly stated, the public do not yet universally realise that the use of electricity is their right, and not a privilege granted by the State to infants, invalids and the aged. If we can only clear away a little of our own negative propaganda, we can sell cookers on their own merits.

THEORY AND PRACTICE

APART from its intrinsic value, the paper on cooling towers which is summarised elsewhere in this issue has particular interest as a comment on the relationship of mathematical theory and empiricism in engineering. Natural draught cooling towers have been successfully developed to meet the requirements of power station generating stations, without any comprehensive statement of the scientific theory underlying their operation. Now such a theory is presented, and it is natural to enquire the extent to which existing designs will be affected. Only slightly, if at all, seems the answer, judging by the author's remarks. The study which produced the theory was undertaken to determine correction curves for extending experimental observations to other atmospheric conditions. In the prevailing absence of reliable data of this kind, the strength and weakness of the empirical method is picked out. Mathematical theory is no successful substitute for the guiding principles which the designer has determined from expensive experience, but it can give a valuable indication on the way to overcome entirely new difficulties. Natural draught cooling towers are essentially complicated, and so far as the new theory rationalises the basis of design, it should help successful applications overseas.

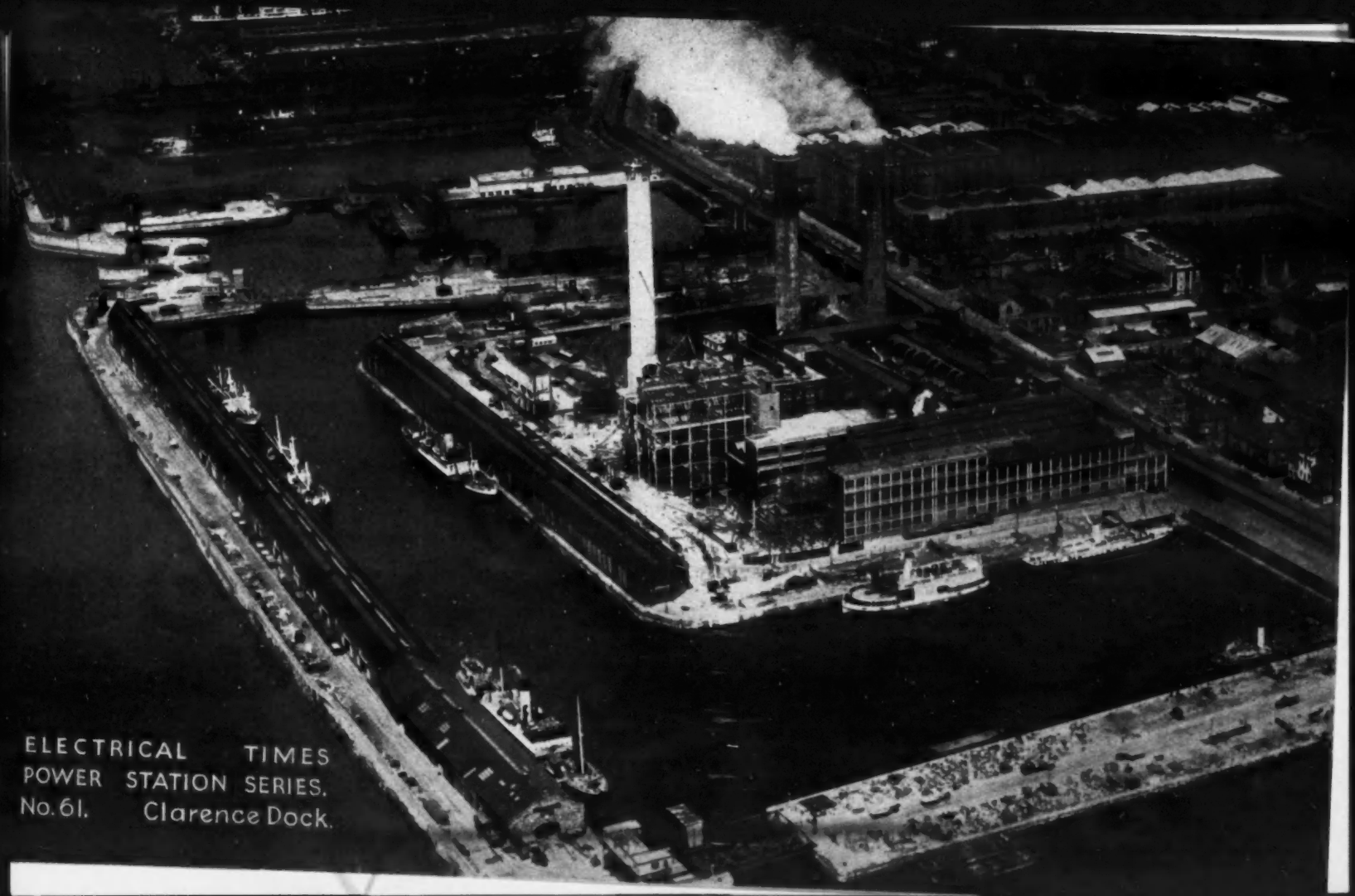
Meteor

THIS WEEK'S PHOTO

CLARENCE DOCK generating station, in the Merseyside and North Wales Division of the British Electricity Authority, is part of the Manchester Grid Control Area, and is built on land reclaimed from the original Clarence Dock. All the turbo-alternators are manufactured by Metropolitan-Vickers, Ltd. Two 51,250 kW turbines were designed to operate at a pressure of 400 lb/sq in. and temperature of 725° F., and three 51,500 kW turbines were designed to operate at a pressure of 600 lb/sq in. and 800° F. All the boilers are made by Babcock and Wilcox, Ltd. Four have a capacity of 160,000 lb/hr and four of 200,000 lb/hr, all with designed operating conditions of 450 lb/sq in. and 750° F. Six 200,000 lb/hr boilers, one of 250,000 lb/hr, and two of 350,000 lb/hr, all with operating conditions of 630 lb/sq in. and 825° F. All the boilers are stoker fired with the exception of the two 350,000 lb/hr boilers which are pulverised fuel fired. The ultimate extensions to the station are at present in progress and comprise two 51,500 kW turbo-alternators and four 350,000 lb/hr boilers of similar type and operating conditions to the existing high pressure section of the station. All the alternators generate at 33 kV except Nos. 1 and 2 which generate at 7·25 kV.

Clarence Dock power station is directly connected to the grid by means of three feeders; also three 33 kV lines feed the Wirral area and 14 feeders supply the area of the former Liverpool undertaking.

In the year ended March, 1949, the units generated were 463 million for the low pressure section and 967 million for the high pressure section and the maximum demand sent out was 101·8 MW for the former and 148·4 MW for the latter. The overall thermal efficiencies were 21·2% and 23·95% respectively.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No. 61. Clarence Dock.

ROTATING AMPLIFIERS

A Comparison of the Principles and Operation of Various Machines

by D. R. N. SEED

FEW types of rotating machines have made more rapid development in recent years than those collectively styled "rotating amplifiers." This class of machine has been produced to meet the need for a d.c. generator of sufficient output to enable it to be used directly for the control of larger generators or motors, and yet requiring a control power sufficiently low for it to be used in automatic control systems with circuit components of small physical size and low power consumption. Such a machine must also possess a very small overall time constant, rapid response being an essential factor in the successful automatic control of electrical machinery.

Applications already developed for these amplifiers include the voltage control of alternators and generators; the control of the power factor and pull-out torque of synchronous motors; torque and speed control of rolling mill motors, mine winders, paper and printing machinery drives; diesel-electric ship and locomotive propulsion and many others: a host of more specialised uses are daily being found for these versatile machines. In this article an attempt has been made to summarise the leading features of the types available.

It will be readily appreciated that an ordinary d.c. generator is, in fact, a rotating amplifier, since the entire output of the machine is controllable by the application of a relatively small amount of excitation power (from about 10% to about 1% of the output, depending on size and speed). If two such generators are arranged with the smaller exciting the larger an overall amplification (defined as the ratio control power: output power) given by the product of the two separate amplifications will be obtained, the control being conveniently effected in the field circuit of the smaller machine. This arrangement forms a simple two-stage amplifier, and though its performance as such leaves a good deal to be desired (for reasons connected mainly with its inherently slow response) it is nevertheless sometimes adopted, e.g. for variable voltage generators or where an automatic voltage regulator is required to control a generator so large that its field current is too heavy for the a.v.r. to handle. Most of the specially designed rotating amplifiers are ingenious arrangements for obtaining the desired two stages in a single machine with a reasonably rapid response, though additional advantages often arise from the particular methods of excitation adopted.

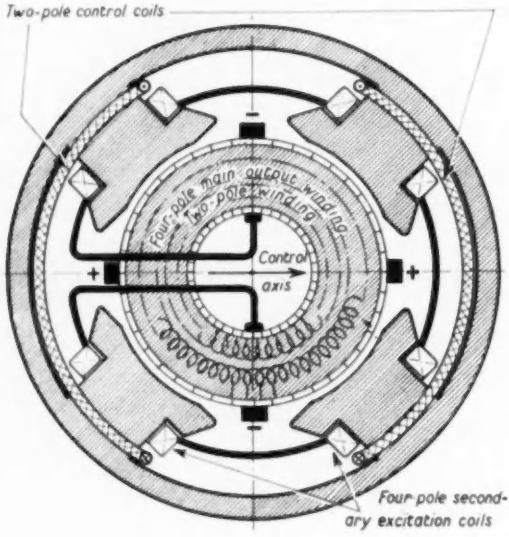

Fig. 1. Diagram of "Magnavolt RR"

The "Magnavolt"

The type of amplifier most nearly analogous to the simple two-machine arrangement above is one which makes use of two separate armature windings (wound for different pole numbers) and two corresponding field windings, the two sets of windings utilising a common magnetic structure; this type is built in this country under the name "Magnavolt RR" (Rapid Response). The most common construction for small machines employs a combination of

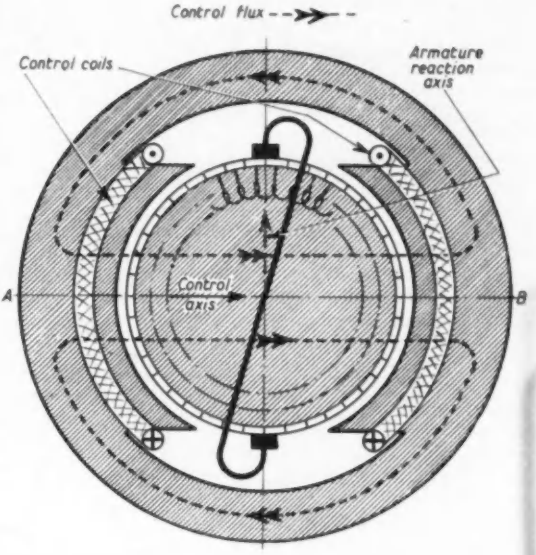

Fig. 2 Diagram of Amplidyne—Stage I

two and four-pole windings (though other 2 : 1 ratios are used to advantage in larger machines), and the general arrangement is shown diagrammatically in Fig. 1. The armature has two entirely separate windings, located one above the other in common slots; each winding is brought out to its own commutator in the usual way, though for convenience the two commutators and their corresponding sets of brush-gear are located at opposite ends of the machine. One winding, the lighter, is wound for two poles, while the other and heavier is wound for four. The field system, though it has four polar projections, carries both two-pole* and four-pole field coils, their axes corresponding in the usual way to lines at right angles (electrically) to their respective brush axes.

The control excitation is applied to the two-pole field coils, and the resultant output from the two-pole brush-gear is fed to the four-pole field coils; the final output is obtained from the four-pole brush-gear. Apart from the slight magnetic un-balance caused by the control (two-pole) and secondary (four-pole) field m.m.f.'s being additive and subtractive on adjacent poles, the machine functions exactly as if it were two entirely independent generators, the one exciting the other; no nett e.m.f. is generated in the four-pole armature by its rotation in the control field, nor does the secondary flux affect the nett e.m.f. in the two-pole armature.

The response time of the combination is made small by the use of as few turns as possible on the exciting coils and by the lamination of the entire magnetic circuit; since the nett mutual inductance of both the field systems and the armature windings is negligible there is no undesirable counter e.m.f. induced in one system as a result of current changes in the other, and this improves still further the response of the machine to the external stimuli applied as control field excitation changes.

The output of each winding is separately proportional to the speed of the machine, so that the overall amplification varies as its square; in consequence the machine is always driven at as high a speed as is convenient. The operation of the machine can, however, be made satisfactory over quite wide speed ranges, provided that allowance is made for the lowest required speed in the initial design.

The commutation of the machine is normal in every way, the usual interpoles being provided when necessary; the load conditions in the main output circuit do not affect the commutation of the first stage output. The electric loading, and consequently the armature heating, is uniform round the whole of the armature periphery.

Armature Reaction Excitation

The next type of machine to be considered, though still a two-stage amplifier, differs from the previous machine in that the m.m.f. of the armature currents themselves (familiar to the student as "armature reaction," and an unfortunate nuisance in conventional machines) is employed to provide the main excitation.

1. *The "Amplidyne."*—Consider a conventional two-pole generator, with a short-circuit applied to its output brushes, and with only sufficient field excitation to cause normal full-load current to flow in the armature conductors (Fig. 2). The applied excitation will naturally be but a small fraction of the normal excitation, since the induced e.m.f. need only be sufficient to overcome the armature and brush contact resistances, instead of the sum of these together with the external load resistance.

The armature reaction m.m.f. has a triangular wave-form varying from zero under the

* In practice the two-pole control excitation may be applied to coils on all four "poles," adjacent coils on either side of the control axis being arranged to produce similar polarities; this is a manufacturing convenience, and the basic theory is in no way altered thereby.

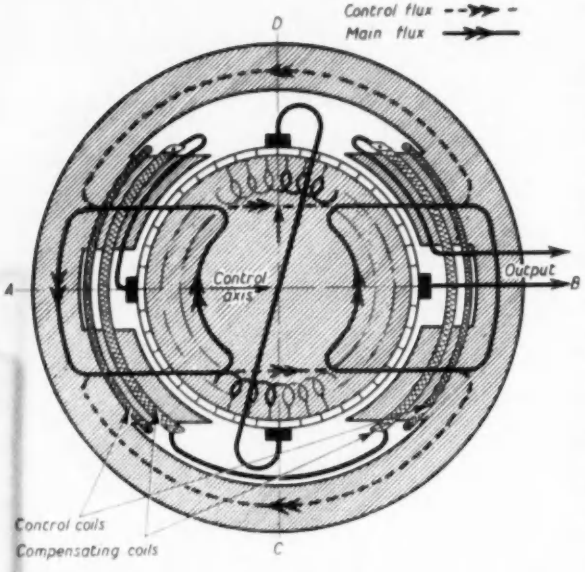

Fig. 3. Diagram of Amplidyne—Final

centre of the pole arc to a maximum at the magnetic neutral axis; its centre-line is along the magnetic neutral axis, and in consequence it tends to set up a magnetic field along this axis and at right angles to the original field. In normal designs the m.m.f. of armature reaction is of about the same magnitude as that of the main field excitation, and it follows that this armature reaction m.m.f. (given a suitable magnetic path on which to operate, instead of the usual high reluctance interpolar spaces) is capable of setting up a magnetic flux in the machine comparable in magnitude to that employable during normal running as a conventional generator. The required low-reluctance path is provided by making the original pole arcs wider than usual and using a uniform air gap; further "inter-polar" spaces are introduced along the centre-line of the original main poles, and as a result the flux distribution of Fig. 3 is set up, having as its axis the line CD on which are placed the short-circuited brushes.

The rotation of the armature conductors in this flux distribution will naturally give rise to an induced e.m.f., and this e.m.f. can be collected by means of a pair of brushes placed along AB (at right angles, note, to CD), in exactly the same way as the short-circuited brushes along CD collect a rotational e.m.f. due to the original flux along the axis AB. To a close approximation the voltage thus obtained will be the same as that which would be obtained were the machine operating as a normal generator (since the same armature is rotating at the same speed in approximately the same flux), and it is clear that this voltage can be used to supply an external load. Thus the full output of the machine as a normal generator is now available, controlled by but a fraction of the normal excitation; the amplification has clearly been greatly increased.

Further, since the control coils will be of few turns and carrying only a small current, while the second-stage excitation is derived not from concentrated field coils but from a distributed armature winding, it follows that the overall inductance of the machine is relatively small. Its response to changes in control excitation will therefore be extremely rapid. Again the lamination of the entire magnetic circuit further reduces the time constant.

The load currents in the armature conductors naturally set up an armature reaction m.m.f. of their own along the control axis AB; this m.m.f. would completely "swamp" the control m.m.f., and it is in consequence necessary to fit compensating windings (in practice distributed in the pole faces in the same way as those often used in large or very high-speed conventional d.c. generators) carrying the load current and so arranged as to balance exactly the load axis armature reaction m.m.f. under the poles (Fig 3).

The compensating winding can, in practice, be made slightly stronger or weaker than is necessary for exact compensation, in order to obtain a compounding effect. It is possible to make the machine substantially self-exciting in this fashion, an extremely high amplification being obtained; this cannot be utilised to the limit, however, as the stability would be adversely affected.

Interpoles are usually provided on the load axis AB to assist commutation, though the provision of the compensating winding considerably reduces the necessary interpole excitation.

On examination it will be found that the load currents in the armature are in some conductors additive to and in others subtractive from the currents flowing as a result of the short circuit.

The electric loading is thus unbalanced, two sections of the winding carrying the sums of these currents and the other two sections their difference; the armature heating is theoretically non-uniform, though in practice the high thermal conductivity of a small armature with an impregnated winding makes temperature variations almost negligible.

2. *The Magnicon.*†—The Magnicon differs from the Amplidyne in that, although it uses the m.m.f. of armature reaction to provide the main working flux, it achieves almost complete separation of control and main fluxes by the use of a half span armature winding. The control and main poles are in consequence adjustable independently as to air gap, magnetic saturation, etc., to obtain the optimum performance; further, the armature reaction m.m.f. is of trapezoidal wave form and is thus at the same time a more efficient producer of flux in the main axis and also more easily compensated by a concentrated coil in the control axis.

The principle of the Magnicon can be examined with the assistance of Fig. 4. There are two control coils and poles on the axis AB, and two main poles (normally unwound) on the perpendicular axis CD; the main poles have an arc rather smaller than that of the normal two-pole machine and the control poles can be smaller again, though in practice they are often made about the same size as the main poles in order to accommodate additional control windings, saturable teeth or other special features. There are two sets of brush-gear mutually perpendicular, as in the Amplidyne, those along the main axis CD being externally short-circuited as shown. A small control coil current sets up the control flux, and the armature rotation in this flux produces an e.m.f. across the brushes along CD; current flows in the armature and in the short-circuiting link. The m.m.f. of armature reaction sets up a flux along the main axis CD, the main poles providing the necessary low reluctance magnetic path, and the rotation of the armature in this main flux produces the output voltage across the brushes on the control axis AB. The armature reaction m.m.f. along BA is suitably compensated by coils on the control axis as shown.

The half-span armature winding reduces the *effective* number of armature conductors to about one-half of the total number, so that for a given speed and output the main flux will require to be twice that of the Amplidyne; greater weights of armature and field iron will therefore be necessary. The chorded winding, however, greatly reduces the copper weight and the axial length of the machine, so that for equivalent outputs the sizes of the two types will not be greatly different. The complete separation (except in the yoke and the armature core) of main and control fluxes is a distinct advantage, as it enables independent magnetic adjustment to be made in either axis; the armature electric loading is uniform, and the armature reaction m.m.f. has the convenient trapezoidal wave form already mentioned.

† See also ELECTRICAL TIMES, September 7, 1950, p. 387

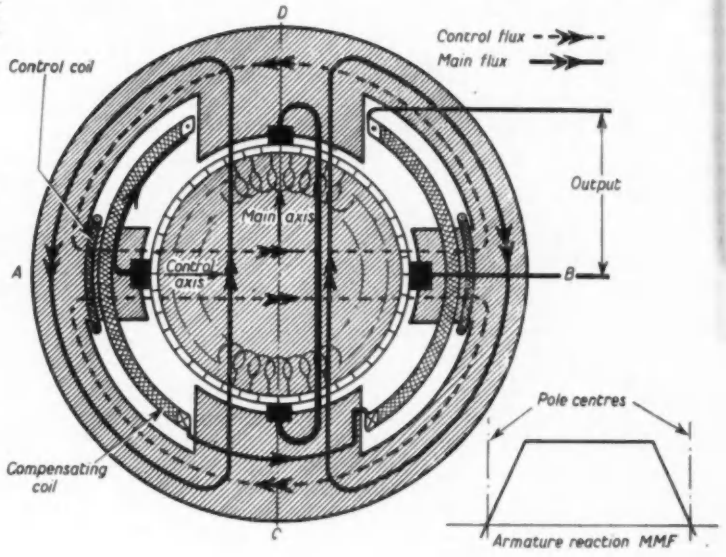

Fig. 4. Diagram of "Magnicon"

It is worth noting that the chorded armature winding is equivalent to the use of a four-pole lap winding *without any equalising connections*; it is well known that such a winding will respond to unbalanced pole fluxes in a four-pole machine and in the Magnicon the control and main fluxes can be considered as a special case of completely un-balanced four-pole fluxes. (This principle is adopted in the Two-Stage Rototrol in the U.S.A., but the resemblance ends there, as the Rototrol uses the first-stage output to excite the second stage field axis by means of ordinary field coils.) The response of the four-pole armature to the two-pole fluxes is not a simple matter, and reference should be made to British Patent 566168 for a fuller explanation.

Single-stage Machines.—In addition to the two-stage amplifiers already described there is available a further type which is often suitable for applications in which the necessity for a substantially constant speed of application is not a serious disadvantage. Known as the Magnavolt SS (and as the Single-stage Rototrol in the U.S.A.) this machine uses a "tuned" field circuit, which may be of either the shunt or series type.

It is well known that a self-excited shunt generator will not build up its voltage unless the total resistance of the field circuit is reduced to a value below that represented on the machine "saturation curve" by a line through the origin along the initial unsaturated portion of the curve (the "air-gap" line). As an example, consider the saturation curve in Fig. 5a. Any field circuit resistance can be represented by a line through the origin of slope numerically equal to the resistance in ohms, the ordinates and abscissae being open circuit voltage and field current respectively, in volts and amperes. The machine will self-excite only if the slope of the line representing its field circuit resistance (including any regulator) is less than that of the "critical resistance" or air-gap line; for example, if the field resistance is $R_1 = V_1/I$ the machine will not excite, but if the resistance is reduced to $R_2 = V_2/I$ the machine will build up its voltage to the point P, at which voltage (V_2) the resistance drop IR_2 in the field circuit absorbs the whole of the terminal voltage and the magnetic flux is stabilised at the corresponding value.

Suppose now that the field circuit resistance of such a generator is adjusted to such a value that it will just NOT excite, i.e. so that the slope of its field resistance line is just steeper than the air-gap line. If it is required to excite this machine to some terminal voltage V then some additional excitation must be provided; it can be easily seen that if this excitation is supplied by additional control coils (wound on the same poles as the shunt coils) they must provide the equivalent (in ampere-turns) of the excitation I_c in Fig. 5b, the remainder I_s being provided automatically at the terminal voltage V by the shunt field. Since the necessary control excitation can obviously be made small compared with the total by keeping the operating voltage below the "knee" of the saturation curve, this arrangement constitutes a single-stage amplifier with an amplification considerably greater than that of the ordinary shunt generator.

This simple device has, however, a number of disadvantages, notably its relatively slow response and its dependence upon a substantially constant speed. Since the control and self-excited coils are mounted on the same poles their mutual inductance will be large; changes in the control field current will induce opposing e.m.f.'s in the main field coils, thus seriously retarding the rate of change of the main output. The self-exciting coils may, however, be of the series type carrying the load current, the principle of operation being unaffected; this is the arrangement most commonly adopted in the U.S.A., and as it leads to a minimum number of field turns (and thus a minimum of inductance) this connection provides a better response than the shunt. Lamination of the magnetic circuit also improves the characteristics somewhat. Constant speed is essential, since the value of the critical resistance varies directly as the speed and the correct "tuning" of the field circuit resistance slope to match the air-gap line is thus possible at only one speed. In practice, however, variations of a few percent. can usually be successfully absorbed, so that, for example, induction motor drive is normally suitable.

General

It will be appreciated that in practice the machines described are liable to appear somewhat complicated, owing to a multiplicity of field coils, brush sets, etc., and their operation may in fact be a little more involved than is apparent from the simple explanations here given. For example the response of these machines is to the nett control m.m.f.; there is thus no need for "signal" voltages to be integrated before application to the control circuits. Instead a number of separate control coils can be provided, connected in various signal circuits as required, and the machine will respond to their combined effect. The accommodation of several control coils presents no great difficulty, as the powers involved are very small. Feedback, from the output voltage

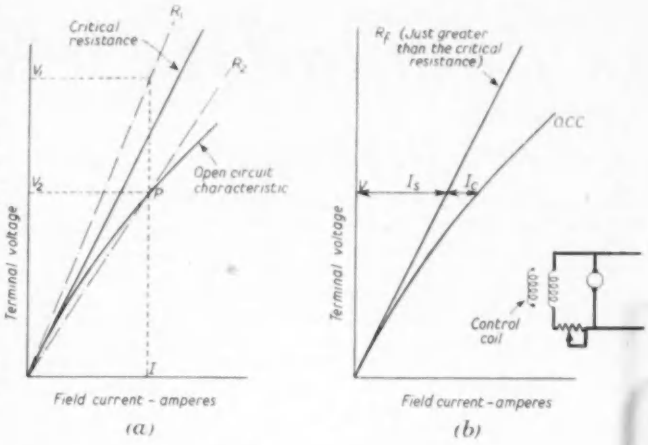

Fig. 5. Characteristics of "Magnavolt S.S."

or current, or from the indirectly controlled quantity (e.g. an alternator voltage) can be readily applied, either directly on the control axis, or, in the case of the armature-reaction-excited machines, by the adjustment of the load axis compensation.

The development of these machines was considerably hastened by war-time conditions, where robust and reliable amplifiers were often needed (for example, for the remote control of searchlights, aircraft gun turrets, etc.) requiring the minimum of control power and being able to withstand a good deal of mechanical shock, etc. Since the war their merits have been still further recognised, and they have been enthusiastically adopted by even the most conservative of industries. Their initial cost is, of course, high by comparison with that of an ordinary generator, but it has been shown that the greatly increased production often obtainable by the automatic control which they make feasible usually far outweighs the initial expenditure; even in comparatively simple applications where frequent switching is required they can often repay their first cost easily by the elimination of heavy current contactors and their necessarily expensive maintenance. Their ability to handle low-frequency a.c. has been proved, and there seems little reason why they should not be employed as phase-advancers for large induction motors where little or no speed control is required.

Applications

Considerations of space prevent a more detailed description of even a few of the numerous ways in which these machines can simplify the problems of the operating engineer; a simple example, however, is the excitation control of a large synchronous motor.

The ultimate "pull-out" torque of a synchronous motor is dependent largely on the ratio field/armature reaction ampere-turns; this feature makes the ordinary machine to some extent unsuitable for loads which have widely varying torque requirements (e.g., rolling mills), since if sufficient excitation for the peak torque condition is continuously applied, the losses throughout the remainder of the cycle will be unnecessarily high, quite apart from the fact that if the peak torque exceeds a certain maximum (dependent mainly on the normal full load power factor) a larger motor frame may be necessary. It will be readily appreciated that if some method can be found to vary automatically the motor excitation in accordance with the torque requirements of the load, the dual object of reducing the light load losses and obtaining a temporary pull-out torque greater than the inherent frame capacity will be achieved.

This can be done very simply by compounding the motor exciter with a "series" field excited (via a rectifier and series transformer) by the motor line current, but for large machines, the power required for compounding is considerable and the circuit components are correspondingly large and expensive. The use of a rotating amplifier to excite the motor exciter greatly cheapens the necessary equipment by reducing, to a fraction of one per cent. of the original, the power required for the "series" field; the output, size, and cost of the transformer, rectifier and auxiliaries, becoming almost negligible. The introduction of the rotating amplifier also makes possible, the provision of additional or alternative control circuits, e.g., to maintain a constant power factor or a constant input of leading kVAr; the necessary circuit components are confined to simple radio-type resistors, inductances, phase-shifters, etc. Such a system would be altogether impracticable if its output were to be required to excite directly even a pilot exciter of conventional design.

Our readers' views . . .

Do You Approve ?

MAY we respectfully suggest to "Meteor" that standardisation, not only of plugs, but of other items, made by the electrical industry, could be achieved more rapidly, if those who have the power to specify, did so wherever possible, and whenever a British Standard Specification is available.

We particularly refer to the 13-amp socket covered by BS.1363.

H. French
Director
F. C. BLACKWELL & CO. LTD.

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Prices of Plugs

WITH reference to "Meteor's" paragraph "Through the Looking-Glass," in the issue of the ELECTRICAL TIMES, October 5, we should have thought that the lesson to be learned is three-fold. The third part should be learned by those technical journalists who do, upon occasion, buy accessories and it is, that they should buy them from an electrical retailer who conforms to the British Electrical Industry Fair Trading Policy Classification and Definition No. 7. Such a retailer would, no doubt, stock at least one reputable range of plugs which, even if not sold at so much per lb., would at least be so priced that 2-pin plugs were cheaper than 3-pin.

S. M. Harris
Director
T.M.C.-HARWELL (SALES) LTD.

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Direct-on Starting

IN your issue of October 5, "Meteor" states that the first move towards the cheapening of control gear is the adoption by Area Boards of a more uniform attitude towards direct starting. I entirely agree. Particularly do I deprecate the practice of giving maximum ratings for direct starting in horse-power rather than current.

About three years ago, if my memory serves me right, B.E.A.M.A. issued an excellent little pamphlet on direct starting, which gave recommendations for maximum instantaneous currents drawn from the line, classified in five grades, ranging from above 200 amps to below 50 amps, which appears to be a sound and logical method. Arbitrary rating in horse-power does not, of course, take into account whether the motor is high or low speed or the actual loading conditions under which it starts. Furthermore, it does not allow any advantage to special designs of motor, such as double-cage and trislot windings, which are specifically designed to give good starting performance with a lower maximum starting current than standard squirrel cage motors.

Another item which is frequently overlooked is the number of starts per day. It would often be permissible to allow direct-on starting in borderline cases where starting duty is infrequent. There is a vast difference between the annoyance caused to other consumers by a momentary voltage drop twice per day and a similar (or even smaller) flicker four or five times an hour.

J. d'Arcy Fothergill
ALDERSHOT

• • •

IN your issue of October 5, you raise the question of direct-on motor starting. I agree that it is high time that some Area Boards revised their ideas upon the subject.

An anomaly which seems to need settling is the relationship between direct-on and star-delta starting. The objection usually raised to direct-on starting is the momentary voltage flicker at the instant of switching on. As anyone who has studied oscillograms of the subject knows, the momentary peak at change-over from star to delta connections may be considerably larger than that due to direct-on switching at full voltage, since in direct switching one is connecting (in effect) an unmagnetised short-circuited transformer, while in change-over from star to delta one is connecting a transformer which may be actually magnetised in the wrong direction at that instant, thus producing a heavier peak. Why, then, allow star-delta starting and exclude direct switching ?

"Puzzled"
LONDON

The Mechanism of Cooling

New theoretical approach gives background for cooling tower design work

IN view of the prominence given recently to cooling-tower problems, the publication, in the "Proceedings of the Institution of Mechanical Engineers,"* of "A Contribution to the Theory of Natural Draught Cooling Towers" has a special interest for electrical generation engineers. This is intensified by the authors' claim that the last theoretical paper on this subject was published as long ago as 1907.

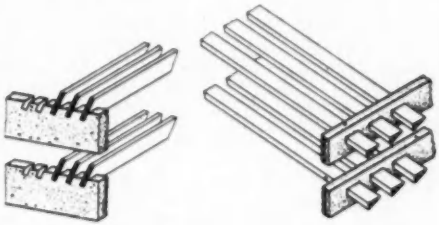
The purpose of the theoretical study was eminently practical since the authors, B. WOOD, M.A., A.M.I.Mech.E., and P. BETTS, B.Sc. (Merz and McLellan) were seeking to establish reliable correction curves to adjust for different conditions tower characteristics which are measured when it works under the specification conditions. Extrapolation is known to be unreliable, the more so since sometimes towers for abroad have to be designed for conditions outside common experience.

Essentially, the type of tower considered is an empty shell forming a chimney, perhaps 300 ft. high. There is free ingress of air at the base, and the lower 30 to 40 ft is occupied by a wooden "fill" over which the water is distributed. Heat is exchanged between the rising air and the falling water, mainly as a result of a difference in vapour pressure, which leads to a transfer of matter in the form of water vapour, with its associated latent heat. The "fill" assists this transfer by keeping the water as a film, or as droplets, and so increasing the surface in contact with the air.

The draught in the cooling tower is created mainly by the air being heated, and mixed with lighter-than-air steam, though the wind makes some contribution to the draught. Above the fill the air velocity is usually 4 to 5 ft/sec. The fill has to impede the flow of water without undue obstruction of the air, and timber is usually the most economical choice for this purpose.

Theory

Three concepts form the basis of the theory developed in the paper. They are the heat balance between air and water, the heat transfer rate as determined by the available surface, and the difference of total heat, and the draught as determined by the density of the air leaving the fill as compared with that of the outside air. These considerations together determine the temperature level at which the tower will work, and are coupled in the synthesis of the theory with the simplifying assumption of absence of cross flow. On this basis either a mathematical or a graphical solution is possible.



A typical splash bar fill, showing the construction of upper and lower tiers

Some results of the theory may be expressed by considering the approach to the wet bulb temperature in ° F plotted to a base of various parameters. The first chosen in the paper is the wet bulb temperature itself, and the theory suggests that the approach must improve (decrease) at higher wet bulb temperatures, falling asymptotically towards zero. Plotted against the elevation of the dry bulb temperature above wet bulb, for constant load and wet bulb, the approach must worsen (increase) with increasing dry bulb temperature. Finally the curve of variation of the approach with cooling range, at constant water rate (lb/hr) should pass through zero and show a tendency to flatten out with increasing approach.

Wind and Draught

Cooling tower draught may be affected by wind eddies, produced by tall buildings or, more probably in view of their height, hills, and by the variation of pressure round the top of the tower which is brought about by the flow of a horizontal wind over it. A positive pressure builds up over a 60° arc on the windward side of the tower, with a maximum magnitude of one velocity head, while the maximum negative pressure occurs roughly at points perpendicular to the wind direction and

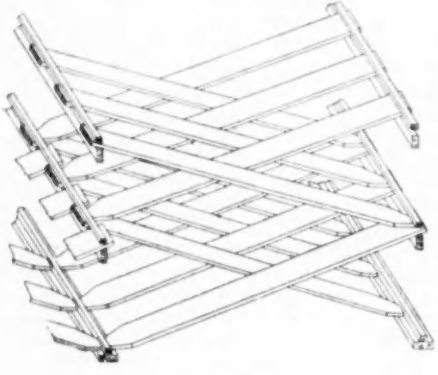
* *Vol. 163, War Emergency Proceedings No. 56.*

is about 2·2 velocity heads. These values apply for wind speeds greater than 0·7 ft/sec for a 100 ft diameter cooling tower. The effect of the negative pressure is to induce the flow out over the sides of the cornice which can often be seen if the vapour plume is watched on a windy day.

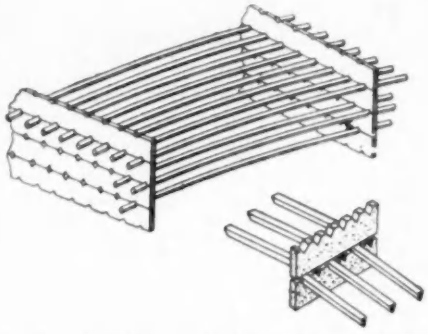
Water Loss

In considering water vapour issuing from a cooling tower, four more or less independent factors have to be considered. First comes the necessary loss of water by evaporation, which the tower is designed to bring about, and which amounts to about 1% of the quantity circulated for the usual cooling range of 12° F, while there is an additional loss of some 0·1% of the circulating water as carry-over in the form of drops some 0·01 in. diameter. These drops, deposited on surrounding property, may cause nuisance. Finally, there is the visible "plume of vapour," which actually consists of water particles of the order 0·0005 in. dia. in size, and which account for perhaps 0·001% of the circulation.

The usual allowance of 1% water loss for 12° F temperature rise is a little high for average conditions in this country. In cold conditions the loss tends to be less and in warm climates more. High humidity reduces the loss, while a higher range of cooling increases the percentage loss leaving the total range unchanged. Carry-over loss, while causing nuisance in built-up surroundings, serves a useful purpose in reducing concentration of solids and so cutting down the quantity of water that must be purged elsewhere to reduce scaling. The style of fill, system of irrigation, and weather conditions all affect carry-over.



Type of lower tier used for film type fill



Further splash bar type fills (a) an all-wood design and (b) a design with concrete supports

Factors leading to a high carry-over loss are a high vertical air velocity at the spray zone and a high concentration of water droplets at the fill or at the spray zone of less than critical size for the air velocity. Carry-over can be decreased by reducing either cause separately, but reduction of carry-over is seldom economically justified by water savings, though it may be imperative from considerations of public relations. Non-splash irrigation is the most powerful method of providing a cure for carry-over troubles, independently of air velocity or water-rate.

Carry-over tends to be increased by one additional factor—the general tapered form of the tower shell. Because of this, air velocity increases with height above the spray zone, and thus particles of water of such size that they would not be lifted at the mean air velocity at spray level may be projected up by a local high-speed stream, and carried through the neck. Although the velocity decreases above the throat, the drops cannot fall back through this constriction unless they grow, which is an unlikely occurrence in the conditions that prevail at this part of the tower. Thus it is probable that particles will remain suspended above the throat, until a gust of wind carries them out of the tower.

No nuisance is caused by the visible plume coming from a cooling tower, since the rate of fall of small particles is so low that there is not risk of their coming down to ground level near the tower. Nuisance is in any case only created when the deposition of water occurs at a faster rate than the air can take it up from open surfaces. A typical size for nuisance causing particles is 0·011 in. mean dia., which falls through 200 ft in one minute. This is for spring conditions: in winter particles will on the whole be larger.

I.E.E. Presidential Address

Telecommunications Today

RECENT technical improvement in the field of telecommunications formed the subject of SIR ARCHIBALD GILL's inaugural address as president of the I.E.E.

He remarked on the singular fact that little change had taken place in microphone development over the last seventy years. However, recent developments in technique and the use of new materials might make possible improvements both in microphone output and receiver sensitivity.

Economics

Capital investment in cables and lines accounted for about 40% of the total cost of a telephone system and this could only be reduced by cheaper methods of construction and by using one pair of conductors for several subscribers. Cross connection to lead-covered underground cables was difficult, but by using street cabinets and pillars containing terminal blocks, this trouble could be partially eliminated. Investigations were also going on as to the advisability of using polyethylene as a protective insulant. The other means of reducing distribution cost by "sharing" lines had been used extensively in America, but not very much here. One of the difficulties was to make the line private so that subscribers could not overhear each other's conversation, but so far no satisfactory method had been found. In general, however, the system of non-private sharing had been quite popular with subscribers who now numbered some 230,000.

Automatic working was steadily being introduced, and investigations were being made into the possibility of electronic switching. Valve life was a limiting function at the moment, and before their use in large numbers in telephone exchanges could be seriously visualised, a life in excess of 100,000 hours was necessary. A further point in this connection was the power supplies, which would be much greater with valve switching than with conventional mechanisms.

Trunk Switching

The International Telephone Advisory Committee was investigating the subject of long-distance dialling for international circuits, but the question was complicated by the wide differences in outlook and technique held by the different countries concerned. Nevertheless, two schemes are to be tried out on circuits interconnecting London, Amsterdam, Brussels, Paris and Zurich. Internally, trunk dialling was going ahead and high-speed, motor-driven, 200-outlet uniselectors were to be used. This project was an essential first step towards an ultimate country-wide scheme of subscriber-to-subscriber dialling with national numbering.

Transmission

The use of amplifiers in conjunction with co-axial cables had proved a milestone in the history of transmission, and the agreed international system was now 960 channels per pair in the frequency range 60-4,028 kc/s, using $\frac{3}{8}$ in. co-axial cable with amplifiers at 6-mile intervals. An interesting new cable which had been laid was the London-Birmingham television cable which carried two large and four small co-axial together with eight screened pairs for music transmission and various other pairs for control purposes. Amplifier stations are provided at three mile intervals along the route.

For transmitting television signals over ordinary telephone circuits, special equipment had been designed to provide amplification and equalisation to compensate for loss and phase-distortion.

Submarine cable carrying capacity had been greatly increased by the use of underwater amplifiers. One of the essentials in these amplifiers was to have valves of high reliability and long life. Progress had been achieved in the production of such valves, and small batches had been manufactured with a predicted life in excess of five years. The work showed that it should be possible to make valves with a life considerably in excess of this figure.

Finally, Sir Archibald referred to the rapid expansion of radio telephone services and mentioned the difficulty of accommodating the number of circuits required within the limited bandwidth available.

Prior to the delivery of the Address, Professor E. B. Moullin, the retiring president, conferred the Certificate of Honorary Membership on Professor E. W. Marchant. The Faraday Medal was awarded to Sir James Chadwick, although the actual presentation will take place at a later date.

Problems and Practice

IN ENGINEERING

Meter Vectors

A SINGLE-PHASE meter on consumer's premises was observed to be rotating in reverse direction during no load conditions, but when a 60 W lamp was switched on the rotation was normal.

Behaviour of this nature is usually found to be due to wrong meter connections, etc. Examination revealed that the meter incoming leads were reversed to normal, and an "earth" had developed in the outgoing neutral lead due to a wet wall.

The reversed rotation on no load was due to the residual current in that portion of the supply neutral where the meter was installed, and depended on the magnitude of the residual, and its phase displacement relative to the meter voltage at the particular time—since the rotation may be reverse, absent or normal at any time, depending on out-of-balance conditions.

To simplify matters, in the diagram non-inductive loads are assumed and the offending meter is shown nearest the supply.

The current vectors for the different phases and the resultants in the supply neutral are shown, and magnitudes have been arranged to explain the particular case.

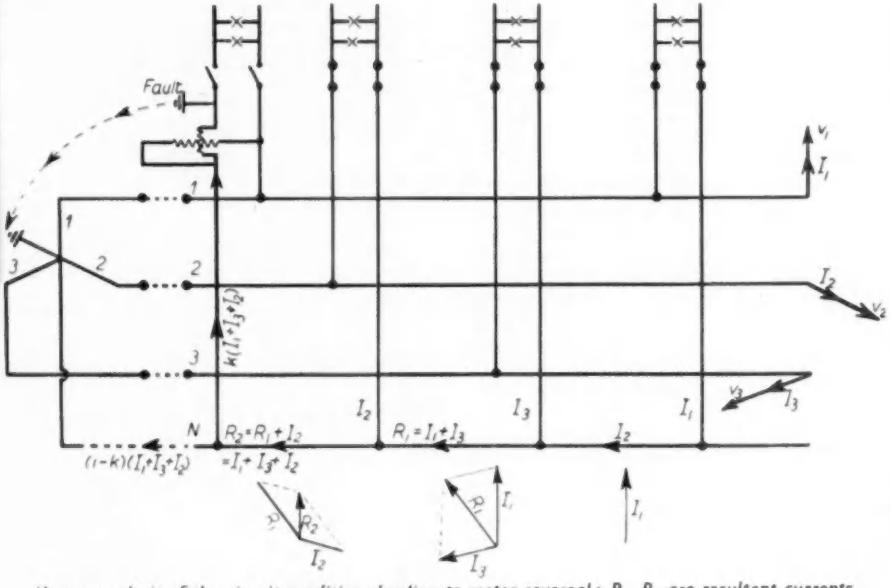
The resultant $I_1+I_3+I_2$ is seen to be co-phasal with the phase voltage v_1 associated with the meter, but the torque due to this voltage flux is reversed owing to reversed connections; and since that portion $k(I_1+I_3+I_2)$ which is shunted by the fault flows in the direction indicated, the torque on the disc is minus $v_1 \times k(I_1+I_3+I_2)$, resulting in a reverse rotation; "k" is a fraction less than half.

When a load of sufficient magnitude is switched on normal rotation ensues, since a reversed current now becomes associated with the reversed voltage flux, the current $k(I_1+I_3+I_2)$ being swamped out.

From the diagram it is seen that:

(*a*) Increased loading of phase 1, other things being equal, will augment reverse rotation;

(*b*) With diminished loading on phase 1, and sufficient increases in the other phases, a

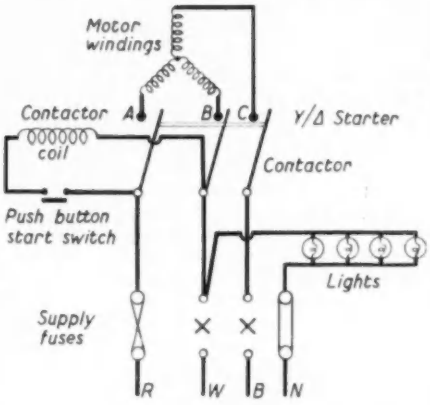


Vector analysis of the circuit conditions leading to meter reversal: R_1, R_2 are resultant currents

resultant in the neutral may be obtained with a 90° phase displacement relative to the voltage v_1, resulting in no rotation, or a resultant with a greater phase displacement giving a forward rotation, and which could be mistaken for creeping on voltage.—"*Solenoid.*"

Powerful Single Phasing

A COMPLAINT was received that a 3-phase a.c. 400 V 15 h.p. motor controlled by a push-button operated air-break star/delta starter, had suddenly stopped and that all the



Connections of the lamps and starter

workshop lights had gone out. It was also reported that, on attempting to start the motor, the lights had come on, but flickered badly; also a rattling noise appeared to come from the starter.

On investigation it was found that two of the supply fuses had blown due to overload. The conditions existing under these circumstances were as shown in the diagram. This only gives the essential wiring necessary for the purpose of an explanation.

It will be seen that W and B supply fuses had blown while R supply fuse was intact.

On pressing the push button "start" switch the contactor coil was connected across the R supply phase and neutral, via the lamps.

Apparently the voltage was just sufficient to energise the coil and allow it to close the contactor. The motor windings A and B were now connected across the red supply phase and the supply neutral, also via the lamps. As the impedance of the motor windings would be comparatively low a current would flow from R phase via motor windings, lamps and back to neutral. This current would be sufficient to cause the lamps to light. Under these conditions, however, the contactor coil would be connected across the motor windings, the voltage across which would be insufficient to allow the contactor coil to hold the contactor closed. Consequently the contactor would open, the lamps would go out and this sequence of events would continually take place while the start push button switch remained closed. The rattling noise, of course, being due to the closing and opening of the contactor. Even now I am a little surprised that the contactor coil was sufficiently energised to operate the contactor when supplied with only approximately 230 V. Unfortunately I was unable to check up on the coil particulars.—*E. A. Robbins.*

The Centre of Load

WHEN planning a distribution network, it is useful to know the load centre, even if it is not always possible or practicable to site the substation at this point. The following method can be used for locating the spot.

A fairly large scale plan of the area concerned with individual loads marked on it is pasted on to a sheet of thin cardboard. A number of discs (cut from $\frac{1}{4}$ in. brass rod) are then wired on to the cardboard to represent the individual loads. It follows, of course, that the greater the load, the thicker the disc fixed at any point. Alternatively, a number of similar discs can be used, each one representing a pre-determined load. The sheet of cardboard with weights attached is then suspended, from an edge, so as to swing freely and the trace of a plumb line is marked on the plan. The sheet is suspended from another edge and a second trace marked. The intersection of the two traces gives the centre of load and this can be checked by taking a third point of suspension.

In a mixed network comprising domestic load, heating installations, and industrial connections, it is a nearer approximation to find the load centres for each of these types of load in turn by the method given above. The after-diversity loads for lighting, heating and power are then estimated and weights representing these are applied at the located individual load centres to give an overall centre of load.—*K. G. W.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

High-Speed Building

Americans Put 100 MW on Line in 10 Months

CAREFUL co-ordination allied to the use of mechanised handling equipment, and psychological consideration of employees' outlook, resulted in the building of an extension to the Acme Station of the Toledo Edison Co. in 10 months.

The installation consists of two 500 klb/hr boilers with steam conditions of 825 lb/sq in., 950° F powering a 105 MW generator with seven stages of bleed heating. The cost worked out at $118 per kW.

An unusual feature, greatly facilitating construction was the use of glass insulated aluminium panels for the exterior walls. Since this type of wall can be erected with ease and speed, the sides of the building were left open as long as possible so that equipment could be placed in the structure at the desired elevation, direct from the delivery trucks.

Labour Consideration

As the labour market was very competitive at the time of construction, considerable pains were taken to make the job attractive. Three workmen's buildings, each 24 ft by 65 ft were put up and equipped with electricity and running water for the shelter and convenience of the workmen, and, as soon as construction permitted, drinking fountains and limited toilet facilities were provided at different elevations in the power station structure.

As the attitude of construction superintendents and foremen reacts on their men, every reasonable effort was made to provide facilities to satisfy this supervisory group.

The men who were to run the plant were encouraged to study the installation as it progressed, and profited by being able to talk to the technical staff of the contractors concerned.

Material Handling

The use of mobile cranes and fork-lift trucks and the use of several cranes simultaneously greatly aided the rate of erection by enabling sections of the steel work to be riveted on the ground and lifted bodily into position.

Two cranes are installed in the turbine room to allow for simultaneous working at different sites where necessary, and were used together to lift in the 178-ton stator. One of these already existed; the other was erected in one day through the open side of the building. The turbine room crane rails were extended beyond the building wall and the bridge crane was lifted bodily on to this extension, run into the building and was ready for operation on the evening of the following day. The beam extensions were then removed.

The turbine was tested mechanically and tripped out on overspeed test just 10 months and one day after the first steel was set. The day after, it went into commercial operation.

NEW LITERATURE

Electrical Resistance Welding

by H. E. Butler

SPOT, projection, seam and butt welding are all forms of the electrical resistance welding process which have become of widespread application and great importance in production engineering. Now that a wide range of machines is available the engineer who has to choose between them and to make the best use of what is ultimately chosen as his equipment needs a knowledge both of the broad principles underlying the operations performed and of the details of machine working. Mr. Butler has written a book to answer these requirements, and has admirably compressed a great amount of information into a volume of handy size, with special attention to the various forms of electronic control which are used. Another aspect of the subject which receives well-justified special attention is the problem of welding light alloys. All in all, this work should prove a valuable addition to the reference library of the production engineer. Published by George Newnes, Ltd., 173 pages, 8½ in. by 5½ in. Price 17s. 6d.

Cathode-Ray Traces

by Hilary Moss, Ph.D.

THE number of patterns which may be produced on a cathode-ray tube by applying various time displacement functions to the "x" and "y" are, of course, infinite. It is, however, of considerable academic and practical importance that the geometrical pattern of repetitious functions should be readily recognised and analysed. This book starts with an analysis of Lissajous figures with integral and non-integral frequency ratios, then to complex and pulse injection into the figures. From there it proceeds to patterns relating to straight-line time bases, circular and spiral time bases, and finally to complex waveforms. An extensive section is devoted to the circuitry and theory underlying the production of the various traces. Many trigonometrical formulae and theories are included in the illustrations.

The book is prolifically illustrated with photographic reproductions of the actual traces under discussion and is well printed and bound. Published by Electronic Engineering, 66 pages, 9½ in. by 7¼ in. Price 10s. 6d.

Research in Illumination

The I.E.S Presidential Address

TAKING office as president at the inaugural meeting of the Illuminating Engineering Society on Tuesday this week, MR. L. J. DAVIES, M.A., B.SC., F.I.E.S., made the basis of his Presidential Address, the subject of "Research, Technological Progress, and Illumination".

Mr. L. J. Davies

Pointing out that illumination was usually referred to as a science or an art but seldom as one of the technologies, the President defined a technology as "the science of an industrial art." Although illumination was made up of a number of industrial arts, such as lamp-making, glass manufacture and fittings design, etc., most of which had their own technologies, there was an overall technology of illumination. Advances in technology arose out of research, development, engineering, production and utilisation. Research could not be isolated and not all took place in the laboratory.

Distinguishing between fundamental, objective fundamental, and applied research, he pointed to the fluorescent lamp as an example of the last-named, whereby a virtually new lamp was created which, however, contained nothing that was not already known. The behaviour and properties of glass, fluorescent powders, discharge through mercury vapour, coated cathodes, and other items were separately known, but it required invention to combine them, and applied research to make possible development of a high-efficiency production article.

Research by the Lighting Engineer

There were, suggested the President, opportunities for lighting engineers to carry out their own research, and he instanced the life of lamps as an example. Though extensive tests are carried out by the manufacturer, details of lamp life under service conditions could often be of value.

A most important avenue for research was the assessment of the benefits of improved lighting. All were agreed that if one took a poorly lighted production area and installed up-to-date equipment, increasing illumination and reducing glare, the results would be worth while—but how much? Changes in lighting were often made simultaneously with rearrangements of the work area and re-tooling; accurate statistics were seldom kept, and definite conclusions were not always possible. Other instances included such items as lighting and colour in offices and lighting for viewing television in the home. The aim should be to try it for oneself, to be inquisitive into such matters and to cultivate the research outlook.

In conclusion, Mr. Davies said, he had endeavoured to indicate that research fits into a pattern in which the various types of research merge progressively with engineering, manufacture, installation and distribution, but that it can only be fully effective if members of all groups give it proper regard. There were, he repeated, plenty of opportunities for anyone to become truly research-minded, which would be a true help to the technological progress of illumination.

Television Principles

ON Monday, MR. I. J. SHELLEY (B.B.C.), the Chairman, opened the sixty-fourth session of the London Students' Section of the I.E.E. with an address on the subject of television. Aiming at a compromise between a general lecture and a specialised paper, he introduced his address with an historical survey of the technique of generating television signals. He picked out for special comment the Smith and May experiments on selenium's photo-electric properties in 1873, and the later discovery that light could cause a change in conductivity, the liberation of electrons, and the setting up of an e.m.f. in a material.

To this discovery the idea of scanning had to be added for television to become a possibility, and in 1911 the use of a mosaic of minute photocells combined with an electron beam as a high-speed scanning device, the basis of present technique, was suggested. By 1930 research into ways of making better use of available light to excite the photocells was started, and eventually this led to the Emitron camera in Great Britain and the Iconoscope in the U.S.A. These cameras and their successors were described and demonstrated by Mr. Shelley.

Scanning results in the formation of an electrical representation of a picture, suitable for transmission over a communication channel. The frequency band occupied by the signal is determined by the number of elements into which the picture is divided, multiplied by number of complete pictures generated every second. With synchronising signals added, the representation becomes a complex waveform which can be transmitted.

Distortion of the signal is an important limitation in transmission, and very high frequencies have to be used. When cables are involved the balanced-pair type on the co-axial design are used for long distances.

PLANT ENGINEERS AND MANAGEMENT

PROBLEMS of co-operation between two important departments of industry were discussed at a recent joint meeting of the local branches of the Institution of Plant Engineers and the Institution of Works Managers which was held in Liverpool recently. Added weight was given to the views expressed by the attendance of some prominent Merseyside industrialists.

Mr. E. G. PHILLIPS, O.B.E., President of the I. Plant E., opened the discussion with some remarks on the key position held by the plant engineer, in contrast with the rareness of his being taken into consultation by management. This latter state of affairs arose from the plant engineers' unsatisfactory status. Actually, the plant engineer had a more varied experience than most professional men, and he now had to prove that there was a place for him at the management consultation table.

Mr. G. L. TILLOTSON, a director of Tillotsons (Liverpool) Ltd., responded, agreeing that the plant engineer was a key man and that in certain circumstances he deserved a better status. Mr. M. SCHOLES (chief engineer, J. Bibby and Sons, Ltd.) thought that the importance of the plant engineer was becoming recognised by top management.

The plant engineers' view was put by Mr. J. BLACK (Glasgow), who called on management to allow the plant engineer to develop his self-expression, and also to attract suitable entrants to the profession. Mr. J. ECCLES, C.B.E. (chairm n, M. and N. W. E. B.), said that the prime need was that the plant engineer should be competent. Management were not technical people, and the plant engineer had to have the ability to write a report and later explain it to his senior colleagues.

There were several other speakers in the discussion whose remarks cannot be reported for want of space.

A New Soldering Development

OF considerable interest, both in the commercial and in the amateur field, is a new soldering device invented by Major Herbert Pearce and Mr. Homewood, of 41 Clanricarde Gardens, London W.2.

As can be seen from the sketch, the instrument consists of a handle containing a spool of solder wire, which is fed by a pressure wheel through a hole in a carbon electrode. This hole is insulated for the electrode length. A potential of about 6 V is applied between the solder and the carbon. Upon making simultaneous contact between the carbon, solder and work by applying the tip of the tool to the metal to be soldered, sufficient heat is generated at the contact point to ensure the instantaneous melting of the solder, and good localised heating is applied to the work at exactly the point to be soldered.

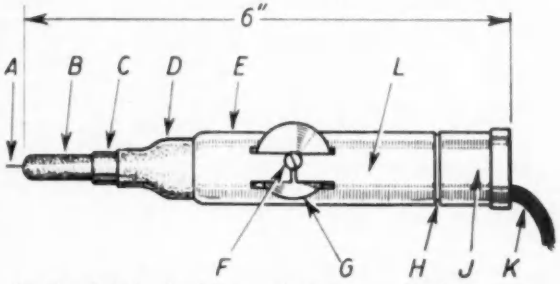
The carbon is selected to have a resistance of about 3 ohms so that a current of about 2 amps flows at 6 V.

Apart from negligible carbon transfer which occurs due to the slight arc which takes place on first contacting the work, there is virtually no consumption of the carbon tube, which has therefore an exceedingly long life. Further, there is no current consumption when the tool is not in immediate use.

Power can be obtained from any standard radio type transformer having a 6·3 V 2 amp winding on it and the instrument can readily be used with all normal lead-tin solder mixtures.

The diameter of the carbon electrode is only 0·4 in., and thus there is little difficulty in reaching joints or tagboards in normal and miniature radio assemblies.

Provisional patents have been taken out covering this tool, but those interested in the development of this type of equipment should contact Major Pearce at the above address.



Sketch of tool. A—Solder. B—Carbon. C—Brass sleeve contact. D—Plastic moulding. E—Plastic cover. F—Feed wheel spindle. G—Thumb wheel. H—Inner tube. J—Cap. K—Lead. L—Solder compartment

EARTH TESTING

Check the complete supply circuit for safety

EARTH fault currents depend on supply voltages, and Ohm's law applies to earthing circuits. These two truisms are often neglected by installation engineers when they check the safety connections of systems, and they are content to ensure compliance with the I.E.E. Wiring Regulations requirement of one ohm or less between the installation earth terminal and any point of the earth continuity run.

Effectively, the earth arrangements are provided to ensure that a fuse blows or a circuit breaker trips when a live wire is directly connected to earthed metal. Should a fault be of high resistance, then it is required that the greater part of the voltage drop should occur from live wire to frame, so that the earthed metal is only a relatively few volts above earth potential. Both of these requirements depend on a low resistance existing in the complete circuit, supply company's neutral—earth—consumer's earth terminal—machine frame. The I.E.E. requirement only covers the last link in this chain.

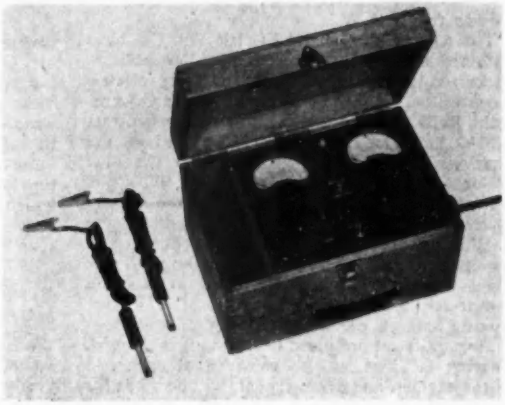
For safety, then, it is advisable to measure the resistance of the full circuit—and ideally, under fault conditions. What may appear to be a good, low-resistance connection when a few milliamps are flowing may fail or heat up dangerously at one spot when subjected to a current of several amperes. The solution, from the safety viewpoint, is to test the whole circuit by injecting a low voltage and using the supply neutral conductor as a return from the transformer star point to the consumer's premises. Such an expedient is, of course, quite well known, and it has been advocated for some time by the responsible Government departments. The difficulty is to perform the test quickly and safely.

By far the most frequent test that is required is that from a three-pin socket outlet, and here the position is eased by the presence of a supply which can be transformed down to give a suitable injection voltage. The secondary of the transformer can be connected between neutral socket and earth socket, and a complete loop tested, the current and voltage being indicated on two meters in and across the loop. In fixing up such a test circuit, care must be taken that the neutral socket, and not the phase socket, is connected to complete the loop.

A compact test set, suitable for this and several other earthing measurements, has been built by John Drummond (Engineers) Ltd., 23 Lockburn Road, Maryhill, Glasgow N.W., and is regarded with enthusiasm by engineers who have worked with it.

For the test just described, the set is plugged directly into the chosen three-pin socket outlet. A neon lamp indicates by lighting up whether the phase and neutral conductors are connected to the appropriate sockets, and a change-over switch is provided to set matters right if necessary. When this is done, the turn of a spring-loaded switch completes the circuit of a double-wound transformer, and a voltage is injected to give a current of some 8 amps in a healthy earth circuit. This procedure, and the reading of the two meters, is readily completed in less than one minute.

Of course, the resistance from a socket outlet is not the only case that requires investigation and, to provide for other circumstances, outlets are provided into which jacks can be inserted, ending in test leads and clips. These are particularly useful when, for instance, the earthing of a three-wire three-phase motor is to be checked, no neutral being available. The neutral can be picked up at a distant point and the other lead connected to the machine frame.



Earth loop tester made by John Drummond (Engineers) Ltd.

overseas news

Singapore Demand Expanding

An increase of approximately 25% in units sold during 1949 is recorded by the Singapore Municipality in its report for that year, just to hand. Total units sold for the year amounted to 129·1 millions, compared with 104·4 millions in 1948. A further 3,097 consumers were also connected, bringing the total to 40,044 at December 31, 1949. The two secondhand boilers purchased from Hull Corporation were put into service, enabling all the 37,000 kW of generating plant to be used, the peak load demand being of the nature of 32,000 kW. Reference is also made to the work proceeding for the erection of the new power station at Pasir Panjang, the first 25,000 kW set for which is hoped to be in commercial operation late in 1952. The demand for hired appliances continued to exceed the supply, and exceptional load growth is anticipated in the domestic field. At the end of the year under review there were 997 electric cookers on hire (an increase of 241), 899 washers (increase 172), and 9,196 fans (increase 2,425). In view of these results, and the surplus of $4,315,946 for the period, Mr. C. C. Payne, M.I.E.E., M.Amer.I.E.E., the municipal electrical engineer, is to be congratulated on a very successful year.

Transformers from Britain

Brisbane City Council has accepted a tender of Laurence & Hanson Ltd. on behalf of Bryce Electric Construction Co., Ltd., valued at £26,111, for eight auxiliary transformers for the Tennyson power station. Delivery is promised in 18 months. It was reported to the council that the Stores Board had instituted a check on the essential motors for the station, for which replacements were not on hand.

Locos for N.S.W.

The Australian General Electric Pty. Co. have obtained an order, on behalf of Metropolitan-Vickers Electrical Co., Ltd., for forty electric locomotives, from the New South Wales Government Railways. Estimated value of the contract is £A2,500,000. The locos will be used on the Sydney-Lithgow line which runs over the Blue Mountains, the supply voltage being 1,500 V d.c. The electrification of this portion of the railway system is being carried out to facilitate the handling of the coal traffic into Sydney. The locomotives will be of the double-bogie 6-axle type, weighing 108 tons each, all axles being motor-driven. Each locomotive is of 3,780 h.p. (hourly rating), the highest power of any locomotive units yet produced in Britain it is claimed. Driving facilities will be provided at each end of the engines, and arrangements will be made for multiple unit running. In addition, regenerative braking equipment is provided.

Diesel-Electrics for Queensland

The Queensland Transport Minister, Mr. Duggan, has announced that tenders are to be called very shortly for nine diesel electric locomotives. Six will be used for long-distance air-conditioned trains on the Brisbane-Cairns route, and one each will be allotted to the Brisbane-Cunnamulla, Townsville-Mt. Isa, and Rockhampton-Longreach lines.

Power for Saskatchewan

Saskatchewan may build its first hydro-electric power development within a few years, J. W. Tomlinson, general manager of the Saskatchewan Power Corporation, stated a few days ago. Construction of a dam on the Saskatchewan River at Fort a la Corne would be undertaken as soon as demand for power in the Saskatoon area and around Melfort and Tisdale warranted it, he said.

St. Lawrence Plan

The Hydro-Electric Power Commission of Ontario and the New York State Power Authority are to renew their efforts to get federal approval in their respective countries for a start on a 2,200,000 h.p. water power development on the St. Lawrence River. The Commission's chairman, Mr. R. H. Saunders, in New York a few days ago said he had conferred during the day with officials of the New York State body on steps which were being taken and should be taken toward approval for the long-awaited development.

Power in Czechoslovakia

Production of electric power was lagging behind the intensive development of Czechoslovak industry, creating a gap which must be filled as quickly as possible, according to Mr. Gustav Kiliment, Czech Minister of Industry. He said that, in 1949, the first year of the Five-Year Plan, construction of electric power plants was far behind the sharply increased requirements of industry. The further great development of industry had increased the gap between production and consumption, thus creating a situation which must be speedily solved.

Cable Plant

The Indian Cable Co., Ltd., will shortly be taking over the 'D' class cable factory owned by the Government, and which came into being during the war, we understand, Actually, Indian Cables were looking after the production in the Government plant. Apart from the purchase of the new factory, it is stated that the hot rod mill will be installed early next year.

Rangoon Reversion

The Rangoon Electric Tramway and Supply Company has this month reverted to private ownership after having operated since Burma's independence as agents for the Government, which has decided against nationalisation of the undertaking.

Pakistan 6-Year Plan

A six-year development plan, estimated to cost 2,600 million rupees, has been prepared by the Pakistan Government, it was announced last weekend. Among the detailed projects are the development of hydro-electric schemes with a total capacity of 200 MW, together with a further 560 MW of thermal power. Preparations for many of these schemes are well in hand.

Bombay and Nationalisation

When criticism was made at the slow progress of the electric grid schemes, in the Bombay Legislative Council recently, the Minister for Public Works, Dr. Jivraj Mehta, said that at one time the Government were in favour of nationalising all electric power schemes, and discouraged private enterprise in that field. But when it was realised that it would not be possible for the Government to take in hand a large number of projects that policy was modified. The Government had since announced that municipalities and co-operative societies would be permitted to start schemes in areas which needed power.

Railway Electrification

Electrification of the Wellington-Hutt suburban railway lines was being pushed ahead as quickly as possible, reported the Minister of Railways, Mr. Goosman, to the House of Representatives in the annual Railways Statement tabled recently. He said the electric multiple-unit rolling-stock so far received from the English manufacturers had been used to improve suburban services on the Paekakariki line. It is considered almost certain that any further electrification would commence at Auckland and proceed to Frankton, at least, before anything further is done at the southern end. The general manager, Mr. F. W. Aickin, had also reported on the electrification of the North Island main trunk line. This report, which has not yet been published, is receiving the Government's attention. In his annual railways statement, released last month, however, Mr. Aickin avers that the railway problems of the future could largely be solved by the electrification of the North Island main trunk line. Its traffic constitutes 60% of the North Island total, 40% of the Dominion total, and is 13% greater than that of the whole South Island traffic on all lines. It was his view that with electrification of the Main Trunk, a certain degree of diesel-electric operation, and the use of diesel mechanical shunting engines in the principal stations, the railways would be revitalised and their cost of operation considerably reduced.

Underground for Auckland

The report of Sir William Halcrow and Mr. J. P. Thomas—just published—recommends the construction of an underground railway in Auckland, N.Z., linking the electrified suburban service, as the means of solving Auckland's traffic problem. The proposed system would involve an estimated capital expenditure of £5,456,500.

Problem in N.Z.

New Zealand is engaged on construction which is beyond its capacity to fulfil, said the general manager of the State Hydro-Electric Department, Mr. A. E. Davenport, opening the annual conference of the Electric Power Boards and Supply Authorities' Association a few days ago. He referred to the severe effect that staff shortages were having on his department and the Ministry of Works. The shortage on the technical side was particularly important, he said, a number having left the department through the inducement of better pay. This difficulty would increase unless steps were taken to rectify the position. He emphasised that care should be taken to concentrate efforts on those works which really matter.

Jo'burg Expansion

The operations of the Johannesburg Electricity Department during the year ended June 30, 1950, resulted in a record profit, we learn. Income amounted to £2,441,193 and expenditure £2,047,527. The department has again made a handsome contribution to the relief of rates. The general manager, Mr. J. C. Fraser, warns, however, that this trend cannot continue indefinitely because the rate of capital expenditure on stations is accelerating. The total number of units sold in the year amounted to 716.5 millions, an increase of 15 per cent.

Mr. Fraser has also reported that with the acquisition of a site at Lombardy for the erection of a new station, preliminary site work and negotiations have now reached the stage where it is necessary in correspondence to refer to the station by name. It is suggested that it should be called the Jan Smuts power station.

Scheme for El Salvador

A 200-feet high dam across the Lempa River is destined to transform the industrial and economic life of El Salvador. Its completion, at a cost of nearly 16 million dollars, will double the volume of electric power now available in the whole Republic. From all sources—hydro-electric, diesel and steam generating plants—the nation's resources at present total just over 31,000 kW.

The Lempa Dam is to be built about 35 miles north-east of San Salvador and will measure 1,600 feet across. Initially two 15,000 kW turbines are to be installed, with room for three additional generating units of 15,000 kW each. Contracts for construction and equipment have been placed in the United States.

PERSONALITIES IN THE INDUSTRY

For many years with Everett Edgcumbe and Co., Ltd., latterly as chief electronics engineer, **Mr. S. de Gruchy** has now joined the Electrical Apparatus Co., Ltd., and been appointed head of their Instrument Department.

After over 48 years service with the Dundee electricity undertaking, **Mr. G. Fowler,** superintendent of the consumers' department, was presented with a radio set by **Mr. P. Philip,** area manager, on retiring recently.

This month, **Mr. L. Drucquer,** M.I.E.E., took up his new duties as manager, home sales (plant and apparatus) to the British Thomson-Houston Co., Ltd. His former position of manager, B.T.H. Switchgear Sales Department, Willesden, has been assumed by **Mr. P. E. Gaze,** B.A., A.M.I.E.E., who was previously personal assistant to Mr. Drucquer from 1947 till May, 1949, when he was appointed assistant manager of the Department. Mr. Drucquer gained early technical training at the

Mr. L. Drucquer

Mr. P. E. Gaze

Polytechnic Engineering College, London, being awarded a gold diploma for electrical and mechanical engineering. He joined the B.T.H. Test Department in 1920, and in 1923 transferred to the Outside Construction staff. He joined the Switchgear Sales Department in 1925, being appointed assistant manager in April, 1939, and manager in January, 1945. During that period he was responsible for many contracts for factories, railway and power stations at home and overseas, as well as switchgear for 132 kV and 66 kV sections of the grid. Mr. Gaze went from Felstead School, Essex, to Trinity College, Cambridge, where he gained second-class honours, Mechanical Science Tripos. He then served a student apprenticeship at B.T.H., Rugby, and obtained experience in various commercial departments before transferring to the Switchgear Department, Willesden, in 1935, originally as a sales engineer. Since that time he has gained considerable experience in the detailed handling of switchgear work for the C.E.B. and B.E.A., and for large contracts for overseas.

The announcement that **Mr. Maurice Solomon,** F.C.G.I., M.I.E.E., is retiring from the Board of the General Electric Co. Ltd. on account of continued ill-health, will be received with regret by a large number of his friends in the electrical industry. He was a scholar of St. Paul's, from which he obtained a Clothworkers' scholarship to enter the City and Guilds Central Technical College. After a short period with Johnson Matthey and Co. and the Nernst Lamp Co., he joined the General Electric Co. Ltd. in 1903 to work in the experimental department of the Robertson Lamp Works. In 1904 he was transferred to Witton as works manager of the Carbon Works, and became general manager of these works at the end of 1905. Mr. Solomon was appointed a director of the G.E.C. in 1915 and in 1920 became managing director of Pirelli-General Cable Works Ltd., a post which he held till 1928, when he relinquished it but remained on the board. He took a very active interest in the affairs of the Cable Makers Association, and was elected chairman in both 1929 and 1936.

Mr. A. W. Barford, who was commercial engineer, B.T.H., London District Office, has been appointed manager of the Cairo Office of the British Thomson-Houston Export Co., Ltd. Mr. Barford is an ex-apprentice of B.T.H. and was a student at the Rugby Technical College. From 1939 until 1945, he was on active service, both on the Continent of Europe and in Egypt, Palestine, Syria, etc.

Mr. T. W. Pollock was appointed managing director of Penman and Co. Ltd. of Glasgow, at a recent meeting of the Board. He will assume office on October 16.

Metway Electrical Industries, Ltd., have appointed **Mr. R. Barker** and **Mr. F. Richardson** as their representatives for the Midland area.

The South-Western Electricity Board has appointed **Mr. A. E. Mulvaney,** former branch manager at Crediton, as Torbay District Commercial Officer. He gained early experience with undertakings in the Midlands before joining Torquay Corporation Electricity Department in 1926. Four years later he became assistant engineer and manager to the Paignton Electric Light and Power Co., joining the East Devon Electric Co. in 1932 as district engineer and manager of the Exe Valley Electric Co., a position he held until vesting day.

A further appointment just made by the Board is that of **Mr. A. V. Sendell** as publicity officer for No. 1 sub-area. He has been with the Bath undertaking for 46 years, and is chairman of the West of England section of the E.P.E.A. On leaving Bath he was presented with a carrier case of artist's colours by **Mr. A. G. Milne,** district manager.

In succession to Mr. C. M. Cock, who has joined the English Electric Co. Ltd., as we announced on August 31, **Mr. S. B. Warder,** M.I.Mech.E., M.I.E.E., M.Amer.I.E.E., has been nominated chief officer electrical engineering, at Railway Executive headquarters of British Railways. Born at Portsmouth and educated at Glasgow High School and London University, after gaining engineering experience with Johnson and Phillips, the General Electric Co., and Asea Electric Ltd., he joined the Southern Railway in 1936, as technical assistant to the electrical engineer for new works. During his tenure of the latter position he represented the railways on many Government Technical Committees. He was appointed new works assistant to the chief electrical engineer in 1943, in which capacity he was concerned primarily with plans for the development and reconstruction of the electrified system. He was a member of a delegation which visited North America in 1946, to study and report on the development of diesel-electric traction, and the possibility of its application in this country. Upon nationalisation of the railways in January, 1948, Mr. Warder became electrical engineer, Southern Region and in October, 1949, mechanical and electrical engineer for that region.

Thorn Electrical Industries, Ltd., have appointed **Mr. C. B. Styles** as senior lighting engineer at the northern branch, Manchester. He was for many years with General Electric Co., Ltd., at Hull, dealing with various lighting problems.

Mr. J. Moore-Ogilvie, has been appointed advertising and publicity manager to High Duty Alloys Ltd. in succession to Mr. D. Courtney Embley.

Certificates for long service, and other mementoes, were presented to six staff members and recently retired members of Taunton sub-area, South-Western Electricity Board, by **Mr. H. Midgley,** deputy chairman, recently. Recipients of the certificates and mementoes were: **Mr. C. B. Day,** recently retired branch manager, Cullompton (48 years' service); **Mr. R. S. Jull,** Ilfracombe branch manager (43 years); **Mr. H. S. Prowse,** Crewkerne district manager (42 years); **Mr. A. King,** Bridgwater district engineer (40 years); **Mr. A. B. Wightman,** recently retired branch manager at Langport (38 years). Illness unfortunately prevented **Mr. F. H. Crowcombe,** district engineer at Minehead, from attending. He has completed 43 years' service.

Until recently co-ordinating engineer with Mr. Ronald J. Harvey, consulting engineer to the New Zealand Government, **Mr. J. E. I. Gaymer,** A.M.I.E.E., M.E.I.C., has on returning to this country, been appointed works manager with Pyrotenax Ltd. and is now located at the company's plant at Hebburn, Co. Durham.

Enfield Cables, Ltd., announce that **Mr. C. Croom-Johnson,** M.C., T.D., has joined the sales organisation of the company. He recently returned to this country after service with the Army overseas, and latterly under the Foreign Office. Prior to the war he served in the radio and electrical industry. The company has also appointed four branch managers—**Mr. E. Evans** at the Cardiff branch, **Mr. C. Wood** at Hull, **Mr. B. Smith** at Brighton, and **Mr. S. J. Murrey,** who was manager at Brighton, moves to the firm's new branch at Southampton.

After thirty-one years service with the St. Helens Cable and Rubber Co., Ltd., **Mr. H. E. Ridley,** representative, is now due for retirement. His successor, **Mr. G. H. Hirst,** has already been appointed and assumed the management of the Bradford office this month. In the meantime, Mr. Ridley has offered to continue his service on a temporary basis, an offer which the company has accepted.

Two new appointments are announced by the Metropolitan-Vickers Electrical Co. Ltd. **Mr. L. C. Richards,** B.Sc. (Tech.), M.I.E.E., is now chief engineer of the transformer department in succession to **Mr. A. C. Ellis,** who, after 32 years in that post, becomes consultant to the department. The second is that of **Mr. R. M. Watts** as superintendent, steel products department (Trafford Park and Stockton Works), who succeeds **Mr. T. Dooley,** recently transferred to the Hot-

Mr. L. C. Richards

Mr. R. M. Watts

point Electric Appliance Co. Ltd. Mr. Richards joined the British Westinghouse Co. as a college apprentice in 1915, subsequently gaining experience in the Transformer Sales Department. After war service, he joined the transformer engineering staff, and in 1935 took charge of the Projects and Tenders section of the department; in this capacity he travelled abroad extensively. For many years, Mr. Richards has been closely associated with the work undertaken by Met-Vickers on behalf of B.E.A.M.A., B.S.I., and other organisations. Last August he was appointed assistant chief engineer of the Transformer Department. Mr. Watts joined M.V. as a trade apprentice in 1920, and after a period as assistant tool engineer, he successively held the posts of tool and planning engineer, development engineer, and, since the beginning of this year, assistant superintendent.

The Council of the Illuminating Engineering Society has awarded the Leon Gaster Memorial Premium to **Dr. R. G. Hopkinson** and **Mr. P. Petherbridge,** both of the Building Research Station, for their paper entitled "Discomfort

Glare in Relation to the Lighting of Buildings". The Society's Silver Jubilee commemoration award goes to **Mr. I. H. Hall**, of Birmingham, for an essay entitled "Some Problems Associated with the Development of the Fluorescent Lamp".

William McGeoch and Co. Ltd. have appointed **Mr. H. Bullas,** ASSOC. I.E.E., as London and South Coast area representative, operating from the firm's London office. After early training and some years experience in a Midland power station, he subsequently served nine years on design, development and technical sales work on electrical appliances with the Automatic Telephone and Electric Co., and the past ten years with Standard Telephones and Cables Ltd. (Radio Section). Prior to the war he was chief of the electrical technical department at the C.W.S. appliance factory, Dudley, and a member of the Birmingham Electric Club.

Mr. C. W. Glanister, M.I.E.E., has resigned his position as chief engineer to the Ceylon Government Electricity Department and has joined the staff of Brush Export, Ltd., which company has been formed to cover the export activities of The Brush Electrical Engineering Co. Ltd.

E. K. Cole Ltd. announce that **Mr. Bentley Jones** has resigned from his position as sales manager of the Radio Division, as from last week-end. He has now joined Thorn Electrical Industries Ltd. as commercial director of the Ferguson Television and Radio Division.

Ekco-Ensign Electric Ltd. have appointed **Mr. R. W. Gaunt** as their representative for part of the Manchester and Salford area. He will be based at the company's Preston office. Mr. Gaunt was formerly an illuminating engineer with G.E.C., Manchester.

Our accompanying illustration is of **Mr. Leslie Gamage,** vice-chairman and joint managing director of the General Electric Co. Ltd., accompanied by the **Hon. Mrs. Leslie Gamage,** *en route* for Liverpool, prior to sailing for Canada in the R.M.S. *Empress of Scotland* last week. (We referred to his visit in our October 5 issue.)

En route *for Canada*

Recently joined the staff of Elexcel Ltd. as demonstrator is **Miss S. Keal,** who has had considerable experience in the industry, latterly as senior demonstrator for Moffats Ltd. Earlier she had been senior housecraft advisor with the Wessex Electricity Co., following experience with the Wycombe Borough Electric Light and Power Co. Ltd.

Miss S. Keal

The Faraday House Gold Medal has been awarded to **Mr. R. P. R. Hunt** for his performance as the best all-round student of the final term of his group. He is a graduate apprentice who joined the Brush Electrical Engineering Co., Ltd.

Two new appointments are announced by London Transport. **Mr. G. E. Taylor,** A.M.I.E.E., becomes technical investigation officer (electrical), responsible to the electrical engineer for all technical investigations and development, including the work of the Testing Section, and **Mr. L. A. M. Ginger,** A.M.I.E.E., is appointed assistant electrical engineer (outdoor), responsible to the electrical engineer for the co-ordination of the operation and maintenance of the generating stations, substations, h.t. mains and distribution sections of London Transport's power supply system. Mr. Taylor started his career with the Newcastle-upon-Tyne Electric Supply Co., and joined the Metropolitan Railway in 1919 as a draughtsman. Before being made substation and supplies engineer, a position he now relinquishes, he was constructional engineer. Mr. Ginger received his education and technical training at Regent Street Polytechnic and with the B.T.-H. Co. Until recently he was assistant for substations and cables in the office of the electrical engineer, new works and development, Railway Executive, being largely responsible for the design and layout of substations and distribution systems for the Liverpool Street to Shenfield and the Manchester, Sheffield, Wath schemes.

Mr. G. Wray, deputy secretary of the South Eastern Electricity Board, was elected first chairman of the Sussex group of the Institute of Public Administration at the inaugural meeting last week.

OBITUARY

The death has occurred of **Mr. M. Homler,** who was manager of the L.N.E.R. Electrical Department at Kirkby Stephen until his retirement three years ago.

We note the death on September 29, of **Mr. W. B. Williams,** aged 84, senior partner of Rouch and Penny, the Bristol electrical contracting concern.

THE SCOPE IN MEXICO

A Market Survey of Electricity Requirements

THE value of a market survey in assessing the possibilities for future development has long been recognised, the method having been employed many times in the electrical industry. The latest report of this type we have received—a market survey of electricity sales and requirements of the Mexican Light and Power Co., Ltd., and its subsidiaries covering the next ten years—is a good example of the thoroughness with which such a survey should be undertaken.

The volume covers the territories served by the companies referred to above, in which the population totalled about 3,800,000 in 1948—a figure which is expected to reach over 5,100,000 by 1960. At present, only 269,600 (or 62·7%) of the families in Mexico City are consumers, compared with an average of 92·8% in the United States. It is estimated that the former figure will increase to 433,000 by 1960.

The average consumption by residential consumers increased 71% during the past 15 years, rising from 333 kWh to 570 kWh in 1948, despite the application of restrictions on many occasions.

Pilferage

The supply undertakings operate a "fixed quota" or "flat rate" scheme, under which consumers pay a fixed amount each month and are limited to a very low m.d. In 1933 over 60% of all residential consumers were thus supplied, their average annual consumption amounting to only 101 kWh—officially. Unofficially consumption was much higher, for it was known that the flat rate system was being utilised by many who contracted to limit their demand to, say, 80 W, but nevertheless, used considerably more. In fact, there were years during the '30's when unauthorised consumption was more than three times as great as sales to residential consumers! Pilferage reached its peak in 1937 and continued at a high rate in 1938, but by that time current limiters were being installed, and these, with legal proceedings, reduction of m.d. limit and other measures, resulted in large-scale transference to metered service. By 1948 flat rate consumers, totalling 64,519, constituted only 19% of the residential connections, their average consumption being 119 kWh.

In more recent years, a new form of unauthorised use developed, as the result of the connection of some 80,000 consumers without meters, of which there was a shortage during the war. This resulted in sizable losses, but the position is gradually improving now. Average consumption by 48,633 metered consumers in 1933 was 623 kWh, and by 1948 the former figure increased to 274,425, but average consumption was only 682 kWh. It must be remembered that during the interim, the smaller consumers diluted the figure considerably.

It is estimated that in 1948 there were 9,600 electric cookers, 93,200 refrigerators, 374,000 irons, and 593,000 radio sets in use in the territory covered by the undertakings. By 1960, the number of cookers should increase to 20,500, refrigerators to 213,000, and irons to 500,000, it is considered, but the number of radio sets in use will probably remain static.

ESTIMATED ENERGY SALES OF MEXICAN LIGHT AND POWER CO.
(Thousands of kWh)

Consumer class	1950	1952	1954	1956	1958	1960
Residential ...	223,000	265,000	315,000	375,000	445,000	530,000
Commercial ...	150,500	186,000	224,000	272,000	323,000	385,000
Small industrial	81,500	92,000	105,000	119,000	136,000	155,000
Large industrial	576,300	675,700	757,500	841,100	923,500	1,007,500
Mines	139,900	140,400	140,900	138,900	136,900	135,000
Government ...	144,100	142,000	153,900	168,000	181,900	198,100
Transport ...	79,000	79,000	79,000	79,000	79,000	79,000
Corn mills ...	19,600	21,000	22,400	23,800	25,400	27,000
Irrigation ...	5,300	6,100	7,000	7,900	8,700	9,700
Sundries ...	8,100	9,300	10,400	11,500	12,700	13,800
Total	1,427,300	1,617,000	1,815,100	2,036,200	2,272,100	2,540,100

To cope with the anticipated increase in demand, the company and the Federal Electricity Commission are engaged in a substantial construction programme which, when completed, will make available 3,450 million kWh per annum by 1954, compared with 1,892 million kWh in 1948. Generating capacity will be increased to approximately 675,200 kW as against a total capacity of 344,100 kW in 1948. Power reserves will continue to be meagre until 1952, when the new power units at Necaxa and Lerma are scheduled to go into operation, and should thereafter be sufficient until about 1959, when additional plant will be required.

Mexico's industrial development received a major stimulus during the last war, in the areas covered by the Mexican Light and Power Co., and it is still steadily expanding, as may be judged from the accompanying table of the estimated total energy sales to the various consumers.

The report deals at some length with each of the principal industries in turn, setting out the record of past energy sales with estimates of future demands. Running to over 200 pages, in addition to innumerable graphs, tables and other statistics, the volume is a good example of a comprehensive market survey.

A COMPACT WASHING MACHINE

THE lack of domestic help has, today, made the lot of the average housewife considerably more arduous than in the pre-war era. Further, the present trend is toward smaller and more compact dwellings. These two facts have inspired Thor Appliances Ltd. to design a washing machine of good capacity, ideally suited to the small dwelling or flat. Parnall (Yate) are making, under licence, a similar washer without the telescopic leg device for distribution through the Area Boards.

Three principal drawbacks have hitherto existed in the design of "baby" washing machines. First, if they were sufficiently low to be stowed under a table or draining board, the operating level was not high enough to prevent stooping and fatigue; second, the removal of water from the machine was by means of bucket and drain hose, and third, power-driven wringers were seldom incorporated.

In the "Stowaway" the first of these drawbacks has been overcome by the introduction of telescopic legs which enable the machine to be raised to its normal operating height by means of turning a handle. The draining problem is solved by a power-driven pump which exhausts the dirty water direct to the sink by an adjustable spout; and, finally, a power-driven wringer can be plugged in to the main motor drive by a located dog-clutch mechanism.

This full-size wringer is stowed, when not in use, in a special compartment at the base of the washer, which can deal with up to 5½ lb. of dry clothes at one time. Overall dimensions of the washer when in the stowage condition are 20 in. square by 25 in. high. The price is £43 15s. plus £11 13s. 4d. purchase tax, making a total of £55 8s. 4d.

Power in the Laundry Industry

VISITING the first post-war Laundry Dry Cleaning and Allied Trades Exhibition held at Olympia last week, this journal was pleased to see that launderers and their engineers are becoming more electricity conscious.

There were nearly 150 stands on which were displayed exhibits representative of the whole laundry industry. Amongst machinery shown were washing machines, hydro intractors, ironing machines, drying tumblers and dry cleaning machinery built by names famous in the laundry industry—Isaac Braithwaites, Thomas Bradford, B.L.M., Watson Laidlaw and Co., Broadbents, Baker Perkins, amongst them. What impressed us was, that almost without exception the exhibits were machines which used electricity in some way or another; whether for driving power for heating compressors or for remote control. The names of many of our friends in the electrical industry were to be seen on almost every machine, on motors, switchgear, etc. Those that we saw included Lancashire Dynamo and Crypto, Igranic Electric Co., Crompton Parkinson, Allen West, B.T.H., Brook Motors, Electrical Apparatus Co., Bull Motors, G.E.C., British Klockner; we are sure that there were many others. Even our old friend "Mr. Therm" showed how gas supplied hot water to a "Bendix" electric launderette.

Much of the equipment shown was of a nature allied to laundering and cleaning, amongst them an interesting electric comparator for checking the colour of the finished "whites". This is the "EEL" comparator, an interesting application of the selenium cell. Principal of operation is that the single light source falls directly on to the upper cell, at the same time being reflected by the sample under test on to the lower cell. The difference in output currents from the two cells is indicated by the microammeter in terms of a logarithmic scale of reflection density and in the standard colour discs introduced by the B.L.R.A. Distributors are H. G. Products Ltd., Lancaster Rd., London.

Electric carpet shampooing machines shown were: the "Electralave" by Shepherds Aerosols; R. G. Dixon's latest introduction, which we described in our issue of September 28; and a model by G. E. Holloway and Son (Engineers) Ltd. which is being marketed by Garnerot and Co. Ltd. This is a hand model for cleaning stair carpets *in situ*.

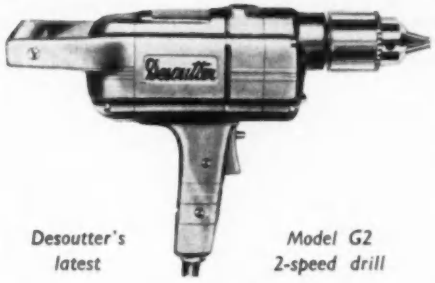
Other allied equipment included a new "DD" electric stocking repairing machine by Dorothy Dean Ltd., which cost £80 but it is claimed will produce from £22-£40 weekly at current prices for hosiery repairs. A relay type Jep "Calicounter" by A. Légé and Co. Ltd. for counting articles fed into the ironing machine and an interesting magnetic level switch, the "Mobrey", by Ronald Trist and Co., Ltd., of Slough, were two other items which caught our eye. The latter is interesting because this use of the magnetic effect obviates the use of glands and packings.

The BUYER'S *Column*

An Entirely New Drill

"DESOUTTER," first name in electric drills and similar equipment, have done it again! Their latest masterpiece is an entirely new two-speed portable drill which is now available on the home market.

The drill is equipped with two sets of helical gears which provide for high or low speed operation—in the "G2" model these speeds are 1,240 r.p.m. and 540 r.p.m. running light—which make the new production virtually two machines in one.



Desoutter's latest Model G2 2-speed drill

Power unit is a universal motor, output of 0·35 h.p. at 490 W, which provides adequate power for either $\frac{1}{4}$ in. or $\frac{3}{8}$ in. drilling in steel, concrete and all types of wood.

The armature is hand-former wound with silk taped coils and runs of ample sized ball-bearings. Special attention has been paid in design to the problem of cooling, a straight-through air flow leads the inlet air over the commutator.

Gears are of heat-treated chrome-nickel molybdenum steel mounted on ball or roller bearings whilst the pressure die cast silicon-alloy body casing with its simple neat design, completes a picture of an efficient, well-designed, well-balanced tool, easy to operate under all conditions. Condensers are fitted to ensure freedom from radio interference.

All tools are supplied with chuck, key (except G2m and H2m fitted with morse taper spindles), breast-plate, detachable handle, and 15 ft. 3-core flexible cable. The address of the manufacturers is DESOUTTER BROS., LTD., The Hyde, Hendon N.W.9.

In Touch Without Expense

INTERCOMMUNICATION between all departments, shops, offices, is something which rates high in the efficiency schedule of the works or headquarters of present-day business firms. Many executives, whilst agreeing with this, have decided against installation on the grounds of unwarranted expense, but we feel that the introduction of the Ediswan loudspeakerphone will win them over.

This loudspeakerphone system, now marketed by the EDISON SWAN ELECTRIC CO., LTD., 155 Charing Cross Road, London W.C.2, is simple to install, requires very little attention, and is relatively inexpensive.

There are two models—"A" which has a standard master unit for six sub-stations, costs £22 10s., and "C" for 10 sub-stations. Prices of this model are available on request. Extensions are £4 5s. each.

The units are housed in attractive black plastic cabinets with cream plastic speaker frets, and are available for use on normal mains supplies. Models are available for 100-120 V and 40 or 60 c/s supplies.

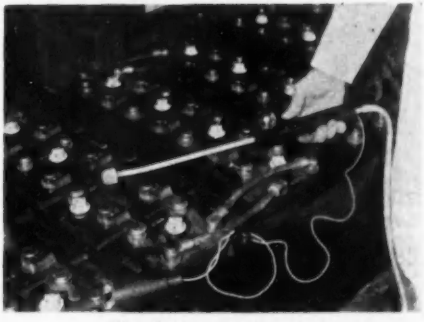
Total length of cable which can be permitted between units without loss of volume is 750 ft.—quite adequate for most purposes.

Complete secrecy is ensured in the design so that no "sub-station" can listen in to the master unit in communication with another station, neither can two stations listen to each other without the knowledge of the respective stations.

Easing Battery Maintenance

TOPPING up of cells whilst the battery is still in position in a vehicle or plant has presented a problem to maintenance and servicing engineers for some time.

A successful attempt to solve this problem has been made by CHLORIDE BATTERIES LTD., Clifton Junction, Manchester, who have introduced the Exide watering gun. This new device comprises a metal tube with a short spout mounted at right angles which is dipped into the cell's vent hole. This tube, which is connected to a length of hose, is insulated with a plastic covering and is fitted with a moulded ebonite hand in which the mechanism is fitted. Water is allowed to flow through the tube to the battery when the acid level rises until it reaches an electrode in the spout. It then completes a circuit thus lighting a lamp in the handle. Therefore when correct level



The Exide watering gun

is reached the operator is warned by the lamp. Incidentally, current for this lamp is supplied from the battery being serviced.

"Dupar" Miniature Limit Switch

NEW arrival on the scene is the type S.W.T. geared limit switch recently introduced by DEWHURST AND PARTNER LTD., of Inverness Works, Hounslow, Middlesex.

It is a miniature pattern geared limit switch with micro-setting and is intended primarily for control circuits in the operation of hoists, cranes, doors, shutters, etc.

It consists of a die cast alloy main frame of robust design incorporating a worm reduction gear having a ratio of 36:1. The drive and tripping shafts are in self-lubricating bearings and the former has an adjustable ball thrust. Drive is transmitted through a steel worm and "Tufnol" wheel to the tripping arms thence to the spring-loaded contact carrying cams.

Moulded Bakelite is used throughout for the insulation which has been subjected to 2,000 V flash test. Nett weight is 2 lb. 12 ozs.

Spring in Mayfair

WE may be getting our film titles mixed but, what we are trying to say is that with the new "Mayfair" electric heater the atmosphere becomes like that of the year's newest season.

This "Mayfair" heater has several novel features. Most noticeable is that it is double-sided, on each side there being a 1 kW rod type element mounted in a reflector fitting, the lower part of which is hinged for adjusting the effective heat distribution. By opening this reflector the heater is in effect two electric fires, by closing the reflectors the unit becomes a convector heater. There is a compartment beneath the lid for use in drying or airing clothes.

A three-position switch gives 1 or 2 kW at red heat or the two elements at black heat (approximate rating 1 kW).

The standard model MEH1 has polished aluminium reflectors and the de luxe model MEH2 has chromium plated copper reflectors. Both units are fitted with an automatic cut-out switch which prevents accidents should the unit fall beyond an angle of 10-15° from the vertical. Price of the standard model is £8 17s. 6d. plus £5 17s. P.T., and the de luxe model £10 10s. plus £7 P.T. Dimensions of both models are 26 in. high by 16 in. by 9 in. and the makers: THE LION STAMPING CO., LTD., Marshgate Lane, Stratford, London E.15.

Price Increases

OWING to increased production costs, we are informed by BERRY'S ELECTRIC LTD., Touch-button House, Newman Street, London W.1, that they have been compelled to raise the list price of their "New Look" water heater. The price is now £10 10s. for the a.c. model, and £11 9s. for the d.c.

Belling's "Homeguard" Fire

IN an advertisement appearing on page 6 of this issue the price of the new "Homeguard" fire, by BELLING AND CO., LTD., Bridge Works, Enfield, Middlesex, is quoted as £13 3s., this should read £13 0s. 3d.

TRADE PUBLICATIONS

NICKEL-CHROME ALLOYS. Nimonic alloys developed to meet the need for a blade material for gas turbine use resistant to high temperature stresses and to creep are the subject of Henry Wiggin & Co., Ltd.'s latest pamphlet. Available from the company at Wiggin Street, Birmingham 16.

LEAD-TREATED STEEL ALLOY. Information on alloy steels containing lead is supplied in illustrated and tabular form in a new brochure by Samuel Fox and Co., Ltd., Stocksbridge Works, Sheffield.

MOTOR STOCK LIST. From Tuscan Engineering Co., Ltd., 447 Grand Buildings, Trafalgar Square, W.C.2, and Bridgend, Glamorgan, comes their current stock list of d.c., single phase repulsion-induction, and 3-phase squirrel cage motors in drip proof, t.e., and flameproof enclosures. Emphasis is laid on the fact that prices are lower than those obtaining a few months ago, but that this cannot be maintained indefinitely.

VARIOUS ELECTRICAL EQUIPMENT. Available from Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, are the following new descriptive leaflets: 85/13-1 Water flow and air pressure control switches; 75/3-1 Drum controllers; 62/7-1 Flameproof oil immersed motor stators; 341/15-1 Attracted-armature pattern instantaneous relays; 270/1-1 Isolating switch type D; 383/1-1 Mercury arc rectifiers, transformers for 376/10-1 Motor driving mechanism for transformer tap changers; 256/1-1 Outdoor oil circuit breaker type CPC.

BED WARMERS. Details of the "Arega" under-bed heater are contained in a leaflet issued by Precision Electric Ltd., 21-23 St. Paul's Square, Birmingham 3.

DISTRIBUTION EQUIPMENT. The first post-war issue of their catalogue is just to hand from H. J. Baldwin and Co., Ltd., of Baldwin House, 132 Arkwright Street, Nottingham. In loose-leaf form, it presents a nucleus of their extensive range of distribution accessories, cable covers, stone-ware conduits and troughing, underground disconnecting boxes, feeder pillars, cable boxes and pre-cast concrete accessories.

THE WEEK

INDUSTRY *in news* COMMERCE

No Encroachment on Green Belt

WITHIN a week of their abandoning plans for the extension of the Bakerloo Tube to Camberwell, the L.T.E. have decided to discontinue construction of the 2¾ miles extension on the Northern line from Edgware to Bushey Heath, Herts. The Bushey Heath project was to have penetrated into London's green belt and, launched in 1937, would have then cost about £2,250,000. Residents in the Bushey area protested against the scheme before the war and objected to the sprawl of London encroaching on a rural area recognised as part of the green belt.

Announcing its decision, the L.T.E. stated that in view of the green belt proposals, introduced since original plans were made, and the consequent restriction on development, there was now no justification for the extension. Construction of the line as far as Brockley Hill, a distance of three-quarters of a mile, may be contemplated later when the area to be retained as a green belt has been more closely defined. The depot erected at Aldenham, which was to have been the terminal, is being adapted for use as an overhaul works for London's bus fleet.

Reason given a week ago for the deferment of the Bakerloo line extension (reported in our October 5 issue) was that the cost, now put at £6¼ million, was considerably more than the original estimate. The line from Elephant and Castle to Camberwell covered a distance of 1½ miles.

Pioneer Honoured at the Abbey

ONE of the pioneers in the generation of electricity was commemorated at a solemn ceremony in Westminster Abbey last Thursday, when the Dean of Westminster dedicated a memorial window to Sir Charles Parsons. Many electrical engineers today will probably remember the great scientist who gave us the steam turbine which led to the turbo-generator of present-day power stations, and turbines which drove our largest ships. Sir Charles died in 1931 at the age of 77. The window in the Abbey is only one outcome of the work of a special committee set up by the Royal Society to arrange an appropriate memorial. Another is the familiar annual Parsons Memorial Lecture, and a third was the contribution of £10,000 towards the Parsons Memorial Library at London House, Bloomsbury, opened by Her Majesty Queen Mary in 1937.

Sir Frank Smith, chairman of the committee, delivered the memorial oration at the ceremony and recounted the highlights of this outstanding career. He told how Sir Charles overcame difficulties which many thought insurmountable to build the first turbo-electric generator, and how a few years later four such generators were supplied to the Newcastle Electric Lighting Co. Sir Frank Smith added that the modern electric power industry might be said to have started with those four engines. He said, "It is to Parsons that credit is due for the gigantic turbo-generators in electric power stations of the world."

Among those present were Viscount Hall, First Lord of the Admiralty, representatives of the B.E.A., Corporation of Newcastle, Institutions of Civil, Mechanical and Electrical Engineers, C. A. Parsons Co. Ltd., Parsons Marine Steam Turbine Co. Ltd., and seven-year-old Andrew Wainwright, a great-great nephew of Sir Charles.

New Lighting Association Formed

FIRST general meeting of the National Association of Manufacturers of Electric Lighting and Allied Equipment was held recently at the Euston Hotel, when the formation of the Association was confirmed and its constitution approved. Mr. A. Stanley Shier, director of Thorn Electrical Industries Ltd., was appointed chairman for the first year. A list of some of the founder members was given in the original announcement of the Association's inauguration in our issue of August 3, and twenty manufacturing firms were said to be represented at the general meeting. Secretary of the new Association is Mr. F. E. Lang, of 145 Palace Chambers, Westminster, S.W.1. Telephone: Whitehall 8972.

The First Half-Century

A recommendation made by the Blackpool Tramways Committee that all members of the Corporation should have free passes over the tramway system, provoked a spirited debate at the last Council meeting. It was urged in support of the proposal that the passes would only be used when travelling on corporation business and directors of tramway companies always had passes. But, the other side argued, tramway companies don't have as many as forty-eight directors; the principle of the thing was bad and opposed to municipal practice in other towns. In the end the recommendation was rejected.—(*From our issue of October* 11, 1900.)

Rural Development in Midlands

THE rural development policy of the East Midlands Electricity Board was given by the chairman, Mr. C. R. King, at the Board's ninth meeting, held recently. He said it was their intention to make a supply available to every village and hamlet as quickly as possible. The charges for electricity to rural dwellers would be the same as for consumers in city and urban areas. Among schemes authorised were two major projects in Lincolnshire which will involve supply to 41 villages and many farms at a cost of approximately £100,000.

The delay in the erection of overhead lines was also discussed at the meeting. There have been several instances of local committees of the Ministry of Town and Country Planning withholding or delaying consents to the erection of supply lines until a new and more elaborate scheme had been submitted. It was decided to ask the C.C. Association and the R.D.C. Association to bring the matter to the notice of their members serving on the Town and Country Planning Committees, so that distribution systems may be developed as quickly as possible.

Association for Ex-apprentices

DURING the last 70 years hundreds of electrical and mechanical engineers have served their apprenticeships at the Brush Electrical Engineering Company's works at Loughborough. Many of the ex-apprentices gathered at the works recently to hold their first official reunion and establish the Falcon Association, which was inaugurated during the past year to keep ex-apprentices in touch with Brush affairs. The name of the Association was derived from the works figure of a falcon, now weatherbeaten, but a new falcon would soon be seen in the same position on its lofty perch, said Mr. J. W. C. Milligan, general manager of Brush, when he welcomed the guests.

The gathering of 120 comprised distinguished visitors from outside, representatives of the company's management executives, ex-apprentices who have taken up positions with other firms and representatives of present apprentice members. After a tour of the works and tea in the canteen, the visitors attended the first annual meeting of the Association. This was followed by a dinner at the Grand Hotel, Leicester.

Smokeless Zones

THE question of creating smokeless zones was referred to by Mr. J. S. Williams, director of the Coal Utilisation Joint Council, in his speech at the National Smoke Abatement Conference at Margate, held recently. The elimination of domestic smoke could only be achieved in three ways, he said: by the extension of the use of gas or electricity, by using solid smokeless fuels or by burning bituminous coal smokelessly. It would be impracticable for gas and electricity to supply the whole load in the zones.

Mr. Williams said there was a big gap between the possible supply of smokeless fuels and the demand, and the solution lay in the development of appliances capable of burning bituminous coal with less smoke. The Council's fear was that if a general movement developed to establish the zones, there would neither be sufficient solid smokeless fuel nor appliances capable of burning coal smokelessly. In consequence the zone movement might well be discredited. A programme by which better and cleaner appliances now available were widely installed would secure an increase in smoke reduction over the whole country, and would be more practicable than the introduction of smokeless zones with their attendant difficulties of fuel supply.

Ex-apprentices of Brush Electrical Engineering Co., who held their first annual reunion at the firm's Loughborough works. Front row (left to right): K. H. Platt, chief education officer; Rex Bate, sales director; J. H. R. Nixon, technical director; J. W. C. Milligan, general manager and local director; P. C. Sharp, director and secretary, and H. K. Partridge, apprentice supervisor

Limited Market in Ecuador

ECUADOR does not appear anything like as happy a hunting ground for prospective businessmen as did Australia in the economic survey referred to in these columns last week. The Survey of Ecuador (H.M.S.O., 1s. 6d.) gives few pointers. Her people's occupation is mainly agricultural and the standard of living of the majority is such that they are unable to purchase the simplest luxuries.

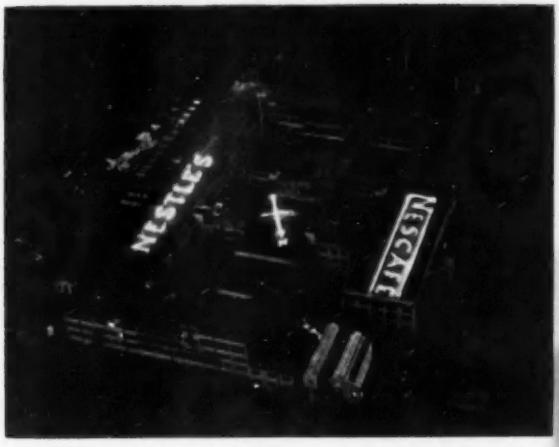
British goods have an excellent reputation in the country, but the U.K. is handicapped by a trade agreement signed by Ecuador and the U.S. in 1938, in which the U.S. is given special duty reductions on a number of commodities including electrical equipment. The budget for 1949 allotted 32 million sucres to water and electricity services (far greater than in previous years) and indicates a determined effort to extend these services beyond the main towns. Telephone systems are poor, and although most major towns are equipped with telephones they are not linked. Telephone equipment is Ecuador's second major import. Rate of exchange is approx. 37·8 sucres to the £1.

We note that Britain has a strong foothold in the provision of diesel engines and pile-drivers, and is virtually the only country to supply Ecuador with cranes, but the U.S. has a monopoly in the supply of electric generators. It should be mentioned that copper production, which averaged 3,000 tons during the war, fell to nil in 1947 and was only 500 tons in 1948. Production of lead, started six years ago, was about 300 tons in 1948.

Imports from the U.K. amounted to 6·3% of the total in 1948, but compared with the U.S. 72·7%, the effect of the trade agreement can be seen. In a list of industrial enterprises we find 13 under "water and electricity" with a total capital of $31,024,000. A table which does much to summarise the position lists Ecuadorean import duties on a selection of commodities. Domestic appliances are termed as either useful but non-essential commodities, or luxury goods, and in both cases have a tariff of 30% *ad valorum*.

Oven Range to Potato Peeler

THREE years ago an all-electric kitchen suitable for a school of 250 pupils was included in E.D.A's stand at the Public Works and Municipal Services Exhibition at Olympia, and the Association has decided to present the section again at the same exhibition to be held from November 13 to 18. The all-electric kitchen will consist of practically every appliance from a double oven range to a potato peeler. The remainder of the stand will be devoted to displays of how electricity can be used for public lighting, and a special feature advocates the adequate provision for electrical services in new housing estates. E.D.A. believes that when the housing problem is solved houses will be difficult to let if electricity is not available for all purposes.



The illuminated sign on the roof of Nestle's factory at Hayes, Middx., as seen by pilots and passengers in airliners

Advertising to Air Passengers

AN illuminated roof sign, solely to advertise to passengers in aircraft, has been erected on the roof of Nestle Co's factory at Hayes, Middlesex. Being near both Heathrow and Northolt airports, the factory is ideally situated for such a venture. In a very short time it is almost inevitable that the advertisement will become an outstanding landmark to pilots and regular passengers in airlines.

The total area covered is over two acres, and to give some idea of the size, the "N" of Nescafe is 32 ft in stroke height, while a compass pointer is 100 ft long. It can be read clearly at over 25,000 ft and is distinguishable as a red glow to aircraft up to five miles away. The red letters comply with surrounding danger signals.

The roof display raised a number of engineering problems. For example, being erected on a flat roof, consideration had to be given to the possibility of heavy snow loads. Furthermore, to keep the factory cool in summer the roof is often flooded to a depth of several inches. All high voltage connections have therefore been specially sealed.

Cost of operation of the sign is about £3 per week with electricity at 1d. per unit, the actual loading being less than 20 kW. The whole installation was designed, constructed and installed by the Claude-General Neon Lights Ltd., a subsidiary of the General Electric Co. Ltd.

New Educational Qualifications

IN 1951 the well understood system of a General Schools certificate and a Higher Schools certificate

as the two nationally recognised standards of general education are to be replaced by a General Certificate of Education. Subjects in this examination can be taken at Ordinary level and Advanced level, the former corresponding roughly to a full credit in the old School Certificate and the latter to a pass at principal level in the Higher School certificate. Since many professional bodies require proof of general education to a given standard in connection with their own examinations, the Ministry of Education have issued Circular 227 setting out the qualifications required in terms of the new General Certificate.

Electrical engineers will be most concerned with the requirements for exemption in 1951 and 1952 from the common preliminary examination administered by the Engineering Joint Examination Board. The various Institutions concerned will accept passes at Ordinary level in four subjects: (1) English; (2) mathematics; (3) and (4) either approved science subjects or one approved science subject and a language other than English. In addition passes at Ordinary level will be accepted as exempting from the common preliminary examination on a "subject for subject" basis.

Wallasey wants to be a Blackpool

WALLASEY traders, particularly those on the New Brighton side of the borough, are endeavouring to plan an illumination display to attract visitors in the same way as people are drawn to Blackpool to see the lights there. New Brighton already has a display, but the six mile promenade between Wallasey and New Brighton presents every facility for a great scheme. The parks which face the seafront provide an admirable setting. Several firms already have their own illumination pieces, but plans are being discussed for a co-ordinated effort. The Corporation Lighting Committee is co-operating, but the project is still in its early stages.

E.A.W. is Busy

NEWS of E.A.W. activities comes this week from numerous parts of the country. At Gravesend, 230 women from branches in south-east England attended a conference where one of the principal papers, "Research Work on Domestic Electrical Appliances," was given by Miss Margaret Leader of the G.E.C. Mrs. E. E. Edwards spoke on the E.A.W. campaign "Towards Perfection" (reported in our Sept. 28 issue), and also presented a short play, "The Lady Who Cooked by Instinct," with the help of Miss Cannell.

From Derby and Holyhead we learn that new branches have been inaugurated recently, while in London the five-day Summer School of Electrical Housecraft was attended by teachers from all over England and Wales and even one from Arnhem. Forty-eight candidates were successful in the electrical housecraft examination for teachers, held in June at centres in London and seven provincial towns. The total number of certificate holders for this examination is now 1,550, while 41 more have been successful in a similar examination for demonstrators and saleswomen. In the latter, 40 gained certificates this year.

Theft from Board

AT Denbighshire Quarter Sessions last Friday, Mr. I. Owen was convicted of stealing £1,999 10s. 11d. from the Merseyside and North Wales Electricity Board, by whom he was employed as a cashier at Colwyn Bay. He was sentenced to six months' imprisonment. Lord Abercornway, the chairman, said the Board had left defendant in possession of money without the periodical check that should have been made. Evidence given at the earlier hearing was reported in our September 21 issue.

Atlas Selling Aids

DETAILS of material available to dealers for Atlas lamps have been received this week from Thorn Electrical Industries Ltd. Showcards and posters are in black, mauve and yellow, and feature a lamp with two eyes drawn on it with the slogan "All the better to see with" at the foot. The choice of slogan is particularly remarkable as it exemplifies the few coincidences which occur in advertising. Two lamp manufacturers have chosen the same slogan for their campaigns this winter. The showcards and posters differ a great deal, however, in design, and there will be no mistaking them.

For counter displays Thorn Electric are supplying a cut-out with a carton on the left and above it the Atlas figure carrying a lamp and saying, "Atlas this time please." Space is also provided on the cut-out in which to fix one of the lamps, below which is the catch-phrase "For staying power." The same slogan appears on a strip 18 x 1½ in. (also for counter displays), with yellow lettering on a blue background. Another showcard features the company's set of a dozen small lamps for Christmas tree decorations.

Electric Plant for Fishing Industry

ELECTRICAL equipment has been installed at St Andrew's Dock, Hull, one of Britain's largest fish docks, to sterilise, wash and rinse empty the fish kits of the Hull Trawler Supply Co. The kit washing machinery was installed by the Yorkshire Electricity Board and consists of three 350 kW electrode boilers, operated during the night load period, to supply steam to jets for cleansing the kits and heating water. The plant takes the form of a tunnel in which the kits are steamed and then rinsed with hot and cold water. A 15 h.p. pump feeds the jets. The installation is undoubtedly an advance in maintenance of hygiene in the fishing industry.

Southern Area three-day Convention

ENGINEERS and graduate trainees in the Southern Electricity Board area attended a three-day convention at the Board's headquarters at

Maidenhead last week. The programme included lectures on aspects of the Board's work, industrial relations and technical subjects, the lectures being supplemented by film shows.

"Electricity Supply in Great Britain" was the subject of the first talk given by Mr. W. Nimmo, chairman of the S.E.B., after which Mr. D. G. J. Millington described the legal work and Mr. W. D. Worthy of English Electric Co. dealt with the A.C. Network Analyser Board. The second day was devoted to lectures on "Protective Gear Relays," by Mr. R. A. Woods, and "The Engineer and Industrial Relations," by Mr. Guy Hunter. There were two lectures also on the final day of the convention, Mr. J. O. Brandon of Pressed Steel Co. speaking on "Modern Applications of Refrigeration," and finally Mr. T. R. Harrison who spoke on "Super-Tension Cables."

About sixty graduate trainees and engineers were present at the convention, and the number was swelled by the part attendance of some district managers and district engineers.

Weld Radiography

CHARACTERISTICS desirable in sensitive papers used in taking X-ray photographs of pressure vessels are set out in publication Ref. T.25 of the British Welding Research Association. The handling and processing of the films, and the resolving of the confusing shadows which are found, are other subjects dealt with. Written by Dr. L. Mullins, PH.D., M.SC., F.INST.P., the booklet has the full title, "Photographic Aspects of the Radiography of Welded High Pressure Vessels," and is obtainable, price 2s., from the Association, 29 Park Crescent, London W.1.

All about Tinplate

PREPARED specially for buyers and users of tinplate, the "Tinplate Handbook" is a 32-page booklet presenting a selection of up-to-date statistics and general information on its subject. Further helpful features are gauge tables and conversion tables, a list of trade terms common in the British and American tinplate industries, together with definitions, and an English-French German-Spanish glossary of the technical terms of the trade. The handbook, which has been prepared by Mr. W. E. Hoare, B.SC. (ENG.), F.I.M., A.I.P.E., is published by the Tin Research Institute, and is available, free of charge, from their head office, Fraser Road, Greenford, Middlesex.

NEWS IN BRIEF

Lord Citrine joined the new B.E.A. collier named after him while the ship was running trials off the Yorkshire coast, and remained aboard for her maiden voyage to Barking power station. The vessel was the third of six being built at Sunderland for the B.E.A., and was launched by Lady Citrine.

The report of the Anglo-American Productivity Council on motor control gear, which was reviewed in our last issue, can also, we are informed, be obtained from the British Electrical and Allied Manufacturers Association at 36 Kingsway, at 2s. per copy post free.

The annual court of governors of the Commercial Travellers' Benevolent Institution will be held at the Berners Hotel, London W.1, on Friday, December 29.

The National Arbitration Tribunal has awarded an additional week's annual holiday with pay, making a fortnight in all, to workers in the electric cable-making industry.

The associate membership examination of the Institution of Heating and Ventilating Engineers will take place in London during the week commencing April 23, 1951. Provincial centres will be arranged if there are sufficient candidates for any particular area. There will be no separate examination for graduateship, as candidates for this grade are now required to pass Section A of associate membership examination.

Electric Supply News

Ayrshire

A seven-year plan, costing £827,000, is to be carried out by the South-West Scotland Electricity Board to complete the electrification of rural Ayrshire. About 1,200 of the 2,600 farms in Ayrshire have already been connected, and the plan is designed to cater for the remaining 1,400. The first scheme, just started, will cost £55,000, and when it is completed in May next year it is hoped that the 92 farms and the 29 other premises in the area of Kilmarnock and Stewarton will be connected up. By that time scheme No. 2 will have started to bring power to the 134 farms and 45 other premises in the neighbourhood of Troon and Monkton. For the purpose of the scheme, Ayrshire has been divided into 15 sections, each of which will be dealt with in turn.

Chichester

Strong criticism was made at the council meeting last week, of the action of the Southern Electricity Board in ending the arrangement whereby the council collected from council house tenants weekly instalments on account of their quarterly electricity charge. The chairman of the Housing Committee said they were concerned mainly with hardship that would be caused to tenants.

Darlington

Following a protest at the cost of supplying electricity to farm cottages at Walworth and to Gt. Stainton Church, the R.D.C. recently considered the reply of the Electricity Consultative Council in which it was stated that the activities of the North-Eastern Electricity Board were

restricted by the limitation of capital expenditure. In the face of this policy the Board had to impose a line of demarcation as to the premises which could be supplied at certain rates, and in this case the limit was hamlets of less than 10 houses. The R.D.C. accepted the charges under protest.

Edinburgh

The Minister of Fuel and Power has now notified the South-East Scotland Electricity Consultative Council that he sees no grounds for intervening in the matter of the disposal of the reserve funds existing in the area at vesting date, and supports the action of the B.E.A. in refusing to return the £1,000,000 reserve funds taken over when the undertakings in the area were acquired. This was reported at the Consultative Council's meeting last week. (We noted earlier discussion in our Sept. 14 issue.) In the Minister's latest letter, dated September 29, he emphasised that the principle underlying the 1947 Act was nationalisation and not regionalisation. Financial responsibility (necessarily accompanied by the appropriate financial power), on the national rather than the regional scale, was an essential feature of the Act, and it appeared to the Minister that the Central Authority had conformed to this underlying principle in approaching the disposal of reserves from the national rather than the regional angle. The Consultative Council agreed to give further consideration of the letter for report at the next meeting.

Hackney

In connection with the plan to extend the Millfields Road, Hackney, generating station of the London Division, B.E.A., the London County Council has now given its consent to the erection of buildings at a greater height than is prescribed in the London Building Act, 1930.

Leicester

Much concern is being shown at the alleged emission of grit from the chimneys of the generating station, and letters protesting have been sent to the Divisional Controller and the station superintendent. An investigation into the matter is at present under way.

Lincolnshire

Two major electricity distribution schemes in Lincolnshire—one in the area north-west of Horncastle, and the other south of Sleaford—have been authorised, it was stated at a meeting of the East Midlands Electricity Consultative Council recently. The two schemes involve the supply to 41 villages, hamlets and many farms, and will cost approximately £100,000, according to Mr. C. R. King, chairman of the Board. He also gave an assurance that electricity would be made available as quickly as possible to every village and hamlet and all except the most isolated farms in the Board's area. The Board intended to allocate sufficient to enable these proposals to be completed in ten years, subject to any Government-imposed limitations.

Marchwood

No objection, in principle, to the erection of a power station at Marchwood, New Forest, on the western side of Southampton Water, is to be raised by New Forest Rural District Council. The council came to that decision on Monday in view of what was described as the extremely sound case presented by the British Electricity Authority, supported by the Ministry of Town and Country Planning. A statement from the B.E.A. said that a new station was urgently needed to meet the increasing demand in the locality. The site at Marchwood comprises about 120 acres above high-water mark, of which 20 to 25 acres would be reserved for coal storage.

Repton

The possibility of erecting a generating station at Willington, in Repton rural district council, is under consideration by the B.E.A., it is reported.

LIGHTING SCHEMES

Aberdeen.—Experiments are now being carried out in King Street, with an installation of vertical fluorescent tubular lights. This system may be installed in Union Street.

Bedford.—The Corporation is recommended to submit to the M.o.T. for approval, a scheme for fluorescent lighting of trunk roads, estimated to cost £20,960.

Blackpool.—It is hoped shortly to start on the £13,000 street lighting scheme, involving some 380 lights, in the Poulton area.

Brighton.—Plans for lighting up the town for Christmas are now being discussed.

Dagenham.—Installation of improved electric street lighting along New Road has been approved by the M.o.T.

Eastleigh (Hants).—Subject to Ministerial sanction, the B.C. is to improve lighting along various roads at a cost of £1,560.

Greenwich.—It is proposed to improve lighting of Shooter's Hill Road, by the provision of 33 lamps, at an estimated cost of £4,184.

Redcar.—The town council has approached the M.o.T. regarding loan sanction for converting some of the towns lighting from gas to electricity.

Scarborough.—Application is to be made for sanction to borrow £5,960 for street lighting on the Corporation housing estate at Eastfield, Seamed.

Shipston-on-Stour.—The parish council have decided to go ahead with plans to install electric street lighting.

Spenborough.—A special sub-committee has recommended the change from gas to electric lighting in Leeds and Whitehall (branch) County Road and Leeds and Elland County Road. Neighbouring lighting is to be studied before deciding the type to be adopted, meanwhile application is to be made for consent to borrow £15,000 for the work.

Waltham.—Grimsby R.D.C. have asked for permission to install street lighting in the village.

Company Activities

Bagdad Light and Power Co.

Revenue for 1949 amounted to £487,338 (*£429,732*). Generation costs absorb £80,992 (*£72,608*), to distribution £47,051 (*£42,659*), expenses £41,657 (*£38,979*), audit fee £577 (*same*), directors' emoluments £4,750 (*£5,150*), Government technical control £225 (*same*), bad debts £83 (*£50*), leaving balance of £312,003 (*£269,484*), plus interest, etc., £961 (*£1,486*), making £312,964 (*£270,970*). To depreciation, renewals and replacements £53,138 (*£44,294*), British taxation and Iraq participation in profits £148,000 (*£136,000*), net revenue £111,826 (*£90,676*), plus provisions not required £1,022 (*£708*). To reserve to finance capital expenditure £75,000 (*£100,000*). Preference dividend £15,400 net (*same*), Ordinary dividend 7% tax free £21,000 (*same*), leaving £6,516 (*£5,068*) carried forward.

Belliss & Morcom Ltd.

For the year to March 31 last, consolidated trading profit was £157,847 (*£71,075*), plus investment income £21,113 (*£23,090*), making £178,960 (*£94,165*). To depreciation £31,692 (*£27,597*), directors' emoluments £9,375 (*£9,305*), taxation £82,236 (*£39,928*), audit fee £850 (*£858*), leaving profit £54,807 (*£16,477*), less profit retained by subsidiary £1,463 (*loss added £206*), provision no longer required nil (*£2,151*), from general reserve nil (*£28,276*), brought in £16,480 (*£13,753*), making available £69,824 (*£60,863*). To preference dividend £3,526 net (*same*), final ordinary 8½%, making 12½% £40,857 (*same*), leaving £25,441 carried forward.

Cawnpore Electric Supply Corpn.

For 1949, interest and dividends, gross, totalled £9,532 (*£9,076 net*), plus transfer fees £13 (*£34*). With £15,922 brought in, the balance is £25,467 (*£47,172*). To management and general charges £5,249 (*£15,547*), directors' remuneration £1,050 (*£1,615*), loss on exchange £34 (*£42*), interest on debentures to redemption nil (*£2,496*), Preference dividends £7,700 (*£11,550*), leaving a balance of £11,434. The realisation suspense account shows valuation fees and other expenditure at £11,685, U.K. expenditure £3,261 (*£4,471*), expenditure in India £8,988 (*£8,086*), making £23,934 (*£12,557*).

Ferranti Ltd.

Group trading balance for the year to June 30 last was £718,969 (*£437,161*). To depreciation on fixed assets £134,714 (*£84,137*), directors' fees £9,549 (*£7,555*), other emoluments £22,670 (*£21,848*), pensions in respect of past managerial services £3,008 (*£2,547*), audit fee £2,649 (*£1,994*), making £546,379 (*£319,080*). Add dividends and interest on unquoted investments £4,616 (*£1,924*), less taxation £302,895 (*£187,977*), leaving net profit £248,100 (*£133,027*). Brought forward is £81,934 (*£124,004*), appropriation from paid in surplus account of Ferranti Electric Inc. £22,438 (*nil*). To 7% preference dividend £19,250 (*same*), 5% second preference £12,317 (*nil*), capital issue expenses written off £9,317 (*nil*), premium on redemption of second preference £4,167 (*nil*), to general reserve £200,000 (*£139,931*), ordinary dividend 6%, less tax on £500,000 (6% *tax free on £300,000*), £16,500 (*£18,000*), leaving £90,921 (*£79,850*). Consolidated current assets are listed at £3,745,641 (*£3,150,673*), current liabilities and provisions £2,828,531 (*£2,251,547*). In his report, Sir Vincent de Ferranti states that the year ended with a record order book of £10,000,000 which will necessitate a further extension of the firm's manufacturing facilities. The erection of transformers has been moved to the new factory, and part of the Hollinwood Works has been converted to a greatly enlarged tank shop. These changes have made possible a 40% increase in output.

Peter Brotherhood

Net profit for the year to March 31, 1950, totalled £120,435 (*£100,527*), including provisions no longer required £7,895, and after providing for taxation £112,540. Final ordinary dividend is 12%, making 20% (*same*).

Reliance-Clifton Cable & Industrial Products Ltd.

Preliminary details for the periods ending November 30, 1949, (holding company 8 months, subsidiaries a year) show a group profit before tax of £197,522 (*£183,918*). To taxation £102,901 (*£97,068*), leaving net profit of £94,621 (*£86,850*), of which £1,155 (*same*) is attributable to minority interests. To dividend on preference and ordinary dividend of 16⅔% for 8 months (*25% for year*) £15,602 (*£23,401*), increase in reserves and carry forward £77,864 (*£62,294 plus £15,436 excess provisions in previous year*). Proposed interim dividend of 10% for 1949-50 (*same*).

Dividends Declared

Babcock and Wilcox. Interim dividend of 5% (*same*) payable on November 3.

Ever Ready Trust. Ordinary and Deferred interim of 5% (*same*), payable on November 1.

A. H. Hunt. Interim dividend of 7½% (*same*), payable on October 21.

Singapore Traction. A dividend is announced on the 7% Cumulative Preference stock for the three years ended September 30, 1944, payable on November 7.

Skefko Ball Bearing Co. Interim dividend of 5% tax free (*same*), payable on November 8.

Solus Teoranta. Final dividend of 5%, making 10% (*both same*), on "A" and "B" shares. Profit for the year to June 30 last was £22,354 (*£24,346*).

Stream-Line Filters Ltd. Interim dividend of 5% (*same*), payable on November 6.

John Summers and Sons. Interim dividend of 10% (2½%), payable on October 27.

John Thompson. Interim dividend of 10% (7½%), payable November 1.

Commercial Information

CONTRACTS OPEN

HOME

Oct. 13.—Belfast. Water screening plant of vertical rotating band type to deal with 2,880,000 gall/hr, for Harbour power station. Merz and McLellan, consulting engineers, Carliol House, Newcastle-upon-Tyne 1. Deposit £5 5s. (See Sept. 14 issue.)

Oct. 13.—Newcastle. Lighting and power installations at Montagu primary school. Applications to H. V. Lightfoot, Director of Education, City Education Office, Northumberland Rd., Newcastle 1. Deposit £5 5s. (See Oct. 5 issue.)

Oct. 13.—Sheffield T.C. Electrical installation to 16 police houses. Deposit £1. Also electrical installation at Acres Hill county primary school, for E.C. Deposit £2 2s. Separate tenders. W. George Davies, City Architect, Town Hall, Sheffield 1.

Oct. 14. — Ceiriog (Denbigh) R.D.C. Re-wiring of electric light and power points in 25 houses, Glyn Ceiriog. R. W. Aubrey, Surveyor, The Mount, Chirk. Deposit £1 1s.

Oct. 14.—Lancashire. Installation of electrical lift at Bleasdale House, Silverdale. County Architect, County Offices, Preston. Deposit £2.

Oct. 14.—Perth. Installation of electricity in 300 houses on various sites. A. L. Bushnell, County Clerk, County Offices, York Place, Perth.

Oct. 14.—Rutherglen T.C. Electrical work in 12 houses at Milrig Rd. J. C. Russell, burgh surveyor, Town Hall Buildings, Rutherglen.

Oct. 16.—Fifeshire. Electrical work in 20 houses at Guardbridge. C. R. Douglas and Co., 15 East Port, Dunfermline.

Oct. 16.—Lisburn U.D.C. Supply of two 12 h.p. electric motors with starters, vee belt drives, switchgear, and electrical installation at the waterworks, Pond Park. T. H. McDonald, Town Clerk, Town Hall. Deposit £2 2s.

Oct. 16.—Portstewart (Londonderry). Electrical installations in 52 houses. N. Ireland Housing Trust, 12 Hope Street, Belfast. Deposit 10s.

Oct. 16.—Southport T.C. Installation of class A lighting in Liverpool Rd., Preston New Rd., Sussex Rd., Union St., and Hill St. Lighting engineer, 117-119a, Shakespeare St., Southport.

Oct. 16.—Stockton-on-Tees T.C. Installation of light and power in 4 shops and 2 flats at each of Ragworth and Albany estates. Borough Architect, 28 The Square. Deposit £1 1s.

Oct. 16.—Swansey T.C. Electrical installation at Penlan primary school. Borough Architect, The Guildhall, Swansea. Deposit £2. (See Sept. 28 issue.)

Oct. 17.—Belfast. Electrical power and lighting installations, and all ancillary services including telephones, fire alarms and X-ray, also lift installations for N. Ireland Hospitals Authority. Secretary, 58 Howard St., Belfast.

Oct. 18.—Metropolitan Water Board. Two sets of electrically driven well and surface pumps for Chingford Mill pumping station, Hall Lane, Chingford. Chief Engineer's Department (Room 235), Offices of the Board, New River Head, Rosebery Ave., E.C.1. Deposit £1 1s.

Oct. 19.—Morley. Supply and installation of a sodium lighting scheme at Drighlington and Gildersome. Morley Hedley, Street Lighting Superintendent, Town Hall, Morley. Deposit 10s. 6d. (See Oct. 5 issue.)

Oct. 20.—Carlisle. Six vertical spindle motor-driven pumps and accessories, capacity 38 million gall per day. L. J. A. Stow, City Engineer and Surveyor, City Engineer's Office, Carlisle.

Oct. 21.—Bromsgrove R.D.C. Pumping plant at Belbroughton comprising 2 centrifugal pumps with motors, switchgear, valves, wiring, etc. Capacity 65 galls per min. Fiddian and Deeley, 13 Church St., Stourbridge. Deposit £3 3s.

Oct. 21.—Manchester. Three compressors, mobile trailer with diesel or petrol engine drive; two 2/3 ton mobile cranes, diesel or diesel/electric driven. Chairman of Waterworks Committee, Town Hall, Manchester 2.

Oct 21.—Saltcoats T.C. Electrical installation in 50 houses on New England site, Robert Rennie, architect, 33 Vernon St., Saltcoats.

Oct. 23.—Shrewsbury T.C. Supply and erection of 56 precast reinforced columns 25 ft high with wiring and fixing of lanterns with H.P.M.V. lamps and gear for Shrewsbury-Hereford (A49) Rd. F. R. Dinnis, Borough Surveyor, The Guildhall, Shrewsbury. Deposit £2 2s.

Oct. 26.—Birmingham. Electrical alterations to Field House, Clent. Herbert J. Manzoni, City Engineer and Surveyor, Civic Centre, Birmingham 1. Deposit £2 2s.

Oct. 27.—Derbyshire C.C. Street lighting equipment on Derby to Nottingham Rd. and roundabout at Spondon. City Surveyor, County Offices, St. Mary's Gate, Derby. Deposit £2 2s. (Advertised in this issue.)

Oct. 27.—Stirling C.C. Supply and erection of 22 concrete lamp columns including 145 yd of underground cable for street lighting on Langton housing scheme. Also erection of 63 steel lamp columns, brackets, lanterns, sodium vapour lamps, switches and laying of 580 yd of underground cable on A9 road. in Laurieston and Polmont. Separate contracts. Thos. F. McGlashan, County District Sanitary Inspector, County Offices, Falkirk. (See Oct. 5 issue.)

Oct. 27.—Sunderland T.C. Electrical installation at Burdon Hall. Borough Architect, Grange House, Stockton Rd. Deposit £2 2s.

Oct. 27.—Warwick T.C. 109 concrete lighting columns, 110 horizontal burning m. vapour lamps and ancillary gear and removal of 60 existing columns on Stratford to Warwick and Emscote Roads. R. Wormwell, Borough Engineer and Surveyor, 20 The Butts, Warwick.

Oct. 28.—Sutherland T.C. Electrical work to a block of 2 houses and 2 garages. E. W. Brannen, Carnegie Buildings, Dornoch.

Oct. 30.—Manchester. Electrical installation at Newall Green infants' school, Wythenshawe. City Architect, Town Hall. Deposit £1 1s. (See Sept. 28 issue)

Nov. 1.—Hastings. Electrical installation in secondary modern school at Red Lake, Ore. Applications to Borough Engineer and Surveyor, 37 Wellington Sq., Hastings, by October 17. Deposit £2 2s. (Advertised in this issue.)

Nov. 6.—West Riding. Electrical installation in Goole Boothferry Rd. primary school. County Architect, Bishopgarth, Westfield Rd., Wakefield. Deposit £1 1s.

Nov. 6.—West Riding. Electrical installations in Pontefract Willow Park infants school and Castleford Airedale (Redhill) infants school. Applications to County Architect, Bishopgarth, Westfield Rd., Wakefield, by Oct. 17. Deposit £1 1s. (Advertised in this issue.)

Dec. 13.—Aireborough U.D.C.* Reinforced columns and brackets, also supp'y of lanterns and auxiliary gear for installation of fluorescent street lighting along 2½ miles of Leeds Rd. Engineer and Surveyor to Council, Council Offices, Rawdon, nr. Leeds. Deposit £2 2s. (Advertised in this issue.)

No date stated.—Arklow, Co. Wicklow. Electrical work for cold room installation at Countess of Wicklow Memorial Hospital. Form of tender from secretary.

No date stated.—Banff. Lighting of Tomintone Main Street. C. G. Taylor, area officer, 67 Moss St., Keith.

OVERSEAS

*Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.*

Oct. 18.—Persia. 60 Field-telephone sets with dry batteries for Works Dept., Iranian State Railways. B.o.T. (Ref. CRE (IB) 65925/50).*

Oct. 25.—Cape Town. Cables and jointing material for a working pressure of 12 kV, neutral point must not be earthed. Cables for pressure of 660 V. City Electrical Engineer, 3rd Floor, Electricity House, Strand St., Cape Town.

Oct. 30.—India. 20,000 Suspension disc insulators. Trade Commissioner for Mysore, 9 Clifford St., London W.1.

Oct. 31.—Johannesburg. Two 35/40 kW and one 20/30 kW generating sets. Also distribution and street lighting network and transmission line. Approx. 265 poles, 60 street lights and 125 house consumers' service connections to be installed. Town Clerk, Outjo. Deposit £2 2s.

Nov. 6.—S. Rhodesia. Eight transformers between 1,000 and 5,000 kVA for Electricity Supply Commission. Secretary, P.O. Box 377, Salisbury. B.o.T. (Ref. CRE (IB) 64994/50).*

Nov. 13.—Johannesburg. One 300 kVA and one 100 kVA transformer suitable for 11 kV/400/230 V. Town Clerk, Hermanus. Deposit 10s. 6d.

Nov. 14.—Pakistan. Supply of cable assault. Commercial Secretary, Supply and Stores Dept., 40 Lowndes Sq., London S.W.1. Fee of 5s. (Ref. SD 7224). Advertised in this issue.

Nov. 28.—Wellington (N.Z.). 50 kV outdoor switchgear and structure for Gisborne substation for State Hydro-Electric Department. Deposit £100.

Nov. 29. — Queensland. Two water-driven turbo-alternators, each of 18,000 kW at 11,000 V, for Tully Falls hydro-electric scheme, for the Cairns Regional Electricity Board. Particulars from Agent General for Queensland, 409-410 Strand, London. Deposit £A3 3s. (Advertised in Sept. 14 issue.)

Nov. 30. — Egypt. Electrically driven air compressor charging bottles, 3 diesel pumps, cooling tower. Chief inspecting engineer, Egyptian Government, 41 Tothill Street, S.W.1. (Ref. 74/GPR 50/42).

Dec. 1.—Tangier. Electrical materials for re-fitting and expansion of Mogago Power Station which will be a 5,750 V installation. Also electrical materials for refitting and extension of Mogago 5,750/22,000 step-up station. Director, Regie des Services de L'Eau et de L'Electricite de la Zone de Tanger, Rue Vermeer, Tangier.

Dec. 6.—Queensland. Erection of 66 kV transmission line between Maryborough and Kingaroy, for South Burnett

Your Queries — Answered

"Heatube" portable airer, makers of? T.E.—Morphy Richards Ltd., St. Mary Cray, Kent. (18839)

"Sterling" portable sander, agent for? T.E.—Equipments Ltd., 35 Green St., Northwood, Middx. (18842)

"Epok" fusegear, makers of? W.W.—G. P. Dennis Ltd., Fleming Rd. Speke, Liverpool 19. (18844)

"Columbine" irons, makers of? A.B.—C.V.A. Jigs, Moulds and Tools, Ltd., Portland Road, Hove 3. (18867)

Louvred attachment to an existing 5 ft fluorescent fitting, makers of? A.W.—Courtney Pope (Electrical) Ltd., Amhurst Park Works, Tottenham, N.15. (18849)

Hamilton Gibbs Co., address of? N.E.—This firm is now at 27 Highbury Hill, N.5. (18812)

"Plumpton" dynamometer, makers of? C.A.—Chas. W. Petherick and Co., Ltd., 20 Send Rd., Send, Woking, Surrey. (18853)

"Reymez" pedestal water heaters, makers of? E.B.—A. Reyrolle and Co., Ltd., Hebburn-on-Tyne. (18859)

The above are selected from questions we have answered this week. If you have a query, send it to us.

ANSWER WANTED

"Vacation" travelling iron, makers of? S.L. (18864)

Regional Electricity Board. B.o.T. (Ref. CRE (IB) 65517/50).*

Dec. 6.—Queensland. 200 Distribution transformers between 5 and 250 kVA; one 66/11 kV, 1,000 kVA, four 66/11 kV, 500 kVA, and two 33/11 kV, 1,000 kVA "on load" transformers; two 66/33 kV, and one 6.6/22 kV, both 1,000 kVA, "off load" transformers. State Electricity Commission. B.o.T. Ref. CRE (IB) 65507/50).*

Dec. 9.—Johannesburg. Steam-raising plant, generating plant, power station switchgear and cabling, for municipality of George. Documents from Preston House, Simmonds St. South, Johannesburg. Deposit £3 3s.

Dec. 21.—Brisbane. 44,000 V automatic outdoor type switchgear. Ten 400 A oil circuit-breakers of 350 MVA, and seven ditto for control of "on load" tap changing transformers. For City Electric Light Co. Ltd. B.o.T. (Ref. CRE (IB) 66325/50.*

PRICES OF CABLE METALS AND OTHER MATERIALS

(at Tuesday evening)

	£ s. d.	New York price
COPPER, electrolytic ...	202 0 0	£156 0 0
Delivered in 2nd and 3rd month after order ...	215 10 0	—
Delivered in 4th, 5th and 6th month after order	217 0 0	—
LEAD, good soft pig (foreign)	128 0 0	128 0 0
,, ,, ,, ,, "English" quality	129 10 0	—
Delivered in 2nd and 3rd month after order, plus	7 0 0	—
TIN (99-99.75%) ... ... (Cash)	862-863	—
,, (3 months)	835-837	—
ALUMINIUM, commercial purity (del.) ...	120 0 0	—
ZINC	151 0 0	140 0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.)	45 10 0	—
Mild Steel Tape (0.04 in.)	26 0 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Madras Electric Supply Corp. Ltd. Resolution for voluntary winding up passed at meeting on Sept. 29. David Evan Webb and Clifford Roxby Akers of 1 Queen Victoria St., London E.C.4 appointed liquidators.

Riley Clock and Instrument Co. Ltd. Creditors to send particulars to Denys Q. Holland, Crown House, Aldwych, W.C.1, liquidator, by Oct. 31.

Voluntary Liquidation

George Forrest and Son, Ltd. At a recent meeting of creditors a statement of affairs, as at July 6, 1950, showed liabilities amounting to £45,896 2s. 4d. In addition £6,175 8s. 11d. was due in respect of preferential claims and £23,229 9s. 5d. to debenture holders. There were net assets of £13,624 9s. 1d., or a deficiency as regarded creditors of £32,271 13s. 3d. Issued capital amounted to £3,705 and there was a total deficiency of £35,976 13s. 3d. The business was originally established in 1896 and in 1937 the limited company was formed. During the war the premises were bombed and heavy loss sustained. Up to the end of 1945 the company traded successfully but had then to start a fresh type of business. Mr. D. Morgan, of 100 Park St., Grosvenor Sq., London W.1, was appointed liquidator with a committee of inspection.

BANKRUPTCY ACTS

Intended Dividend

Scarborough. Kenneth Richard Gregg, trading as refrigeration manufacturer at Colley's Yard, Sherwood St. Last day for receiving proofs, Oct. 13. Trustee: James K. Snow, Alma Chambers, Scarborough.

Dividends

Ashton-under-Lyne. Ernest Cheetham, electric contractor, trading at 377 Ashton Old Rd., Manchester. First and final dividends of 1s. 3d. in £ payable at Office of Official Receiver, 20 Byrom St., Manchester 3, on Oct. 13.

First Meeting

Salisbury. John Stewart Anderson, of Nearavon, Salisbury St., Fordingbridge, trading as "Electronic Services." Date of first meeting, Oct. 16. Public examination at the Guildhall Salisbury, at 2.30 p.m. on Dec. 7.

TRADE NOTES

Agent.—Mr. G. Johnson, of 57 Keswick Rd., Sheldon, Birmingham 26 has been appointed by The Arora Co. as their representative in Birmingham and the West Midlands.

Aluminium Price Up.—The price of virgin aluminium in ingot form has been increased by £8 to £120 a long ton, delivered, as from Oct. 9.

B.S.I. Manchester Office.—The British Standards Institution has opened a branch office at 12 Hilton Street, Manchester 1, Telephone: Central 4856, under the charge of Mr. A. F. B. Nall, assistant technical director. Here, British Standards may be consulted and copies purchased.

Change of Address.—The branch office and stores of London Electric Wire Co. and Smiths, Ltd.; and its associates have moved from 16 to larger premises at 41 Market St., Brighton. Tel. number remains the same, viz. Brighton 24850.

France's Open List.—The goods which may be freely imported into France, Algeria and the French Overseas Departments, include generators, motors, rotary convertors, insulated wire and cable, portable lamps, lighting apparatus, lamps, tubes, arc lamps, and soldering irons.

Goods to Italy.—The list of goods which are now allowed to be imported freely into Italy, under the European trade "liberalisation" agreement includes illuminating and signalling glassware, lighting apparatus, chandeliers, electrostatic transformers, insulators, electric lamps and tubes, electro-medical apparatus, equipment for telegraphy and telephony, radio-electric apparatus, photo-electric cells, electric meters and clocks.

New Branch.—Newey and Eyre Ltd. have opened a new branch at 87-88 King St., Dudley, Worcs., Telephone: Dudley 4411, under the management of Mr. G. W. Arnold.

Telephone.—The new telephone number of British Insulated Callender's Cables Ltd.'s Chester branch is now Chester 23496/7.

Zinc Supplies.—The Ministry of Supply has announced that until further notice, industrial consumers of zinc will only be allowed to purchase each month not more than 90% of their average monthly consumption in 1949.

BUSINESS PROSPECTS

HOME

Aberdeen E.C. has approved erection of primary school at Kaimhill and infant school at Northfield at estimated costs of £123,800 and £79,400.

Banffshire. C.C. to erect 12 houses at Newmill, 4 at Port Gordon and 6 each at Whitehills and Dufftown.

Bolton T.C. Erection of 90 houses on Johnson Ford estate, first installment of 650 dwellings. Housing Director, Town Hall.

Bootle T.C. Erection of 110 dwellings at Netherton. Borough Surveyor, Town Hall.

Brandon and Byshottles (Durham) U.D.C. Supply of materials in all trades in erection of 46 houses at Brandon Colliery. F. Hedley, Architects Dept., Council Offices, Langley Moor.

Brighton T.C. Erection of factory at Hollingbury covering 9,500 sq ft. D. J. Howe, 26-30 Kings Rd., Brighton.

Cardiff. Erection of infants' school. City Surveyor, City Hall.

Cardiff. Erection of 258 houses in six groups on Fairwater No. 5 site, and 212 houses in four groups on North Llanishen site. City Surveyor, City Hall, Cardiff.

Castle Donington (Leics.). R.D.C. to erect 42 houses at Windmill Fields.

Chester-le-Street R.D.C. Plans have been prepared for erection of 21 houses at Ouston and 6 at Lumley. Architect is F. Bowman.

Corby (Northants). U.D.C. approved plans for erection of 500 houses on Lodge Park estate.

Dewsbury T.C. Erection of secondary modern school at Bank Top. Borough Architect and Buildings Surveyor, Town Hall.

Doncaster. T.C. recommended to invite tenders for 40 trolley buses.

Dronfield U.D.C. Construction of 40 flats at Snape Hill. R. S. Woodhead, Council Offices, Manor House, Dronfield, Derby.

Durham. Tenders being obtained for completion of Easington Colliery secondary school, County Architect, Court Lane, Durham.

East Riding. Erection of primary school at Bridlington. County Architect, County Hall, Beverley.

Hartlepool T.C. Tenders are to be invited for building 50 houses under 1951 programme. Borough Engineer is R. H. Snowball.

Heston and Isleworth. Erection of 14 dwellings and 12 bungalows on Hounslow West estate. Also erection of 46 houses and 24 dwellings on Twickenham Rd. estate. Borough Engineer and Surveyor, O. P. F. Hilton, 88 Laimpton Rd., Hounslow.

Kilmarnock T.C. Dean of Guild Court has approved plans for erection of 134 houses on Shortlees estate at estimated cost of £159,492. Also for 36 in Ayr Rd., and 6 in Alton Hill Ave., and Weston Rd.

Lancashire. Erection of police headquarters at Stretford and of classrooms at Lancaster Skerton junior and infants' school. G. Noel Hill, County Architect, County Offices, Preston.

Merionethshire. Erection of primary school at Dinas Mawddwy for E.C. N. L. Jones, County Architect, County Offices, Dolgelley.

Morpeth R.D.C. Plans have been prepared for erection of 18 houses at Longhorsley. No contracts have been let. J. R. Miles, Borough Surveyor.

Newcastle. Preliminary plans have been approved for erection of Rutherford grammar school.

Northumberland. Tenders are being invited for erection of county modern school at Wooler. County Architect, County Hall, Newcastle.

Norwich. Erection of 76 dwellings at Cooper Lane estate and 80 at Hellesdon Rd. City Architect's Office, City Hall, Norwich.

Portadown T.C. Erection of 156 houses on Killycomaine estate. Roe, Stevenson and Sons, 33 College Gardens, Belfast.

Redditch (Worcs.) U.D.C. Erection of 28 houses on Batchley estate, in two contracts. Edward Buckley, Engineer and Surveyor, Council House, Redditch.

Rotherham T.C. Erection of secondary school at Oakwood. Applications to Director of Education, Education Offices, Domine Lane.

Scunthorpe T.C. Plans have been approved for erection of 60 flats in four blocks on the Queensway and also of 10 houses.

Sheffield T.C. Plans approved for erection of 104 houses on Littledale estate.

Smethwick. Erection of 22 dwellings in one block at Abbey Rd. D. M. Waite, Borough Engineer and Surveyor, Council House, Smethwick.

Stourport (Worcs.) U.D.C. Conversion of 64 huts into 132 bungalows. Henry King, Quantity Surveyor, 28 George St., Balsall Heath, Birmingham.

Stratford-on-Avon T.C. Erection of 27 houses on Redlands estate. Borough Engineer, Municipal Offices, Stratford.

Stretford T.C. Erection of 20 flats on Sandy Lane site. A. H. Perry, Borough Surveyor.

Swansea T.C. Erection of primary school at Mayhill. H. T. Wykes, Borough Architect, The Guildhall, Swansea.

Tottenham. Erection of 60 flats in three blocks on Tewkesbury estate. Borough Engineer and Surveyor, Town Hall, N.15.

Welton R.D.C. Construction of 16 houses at Nettleham. Architects are Wm. Saunders and Partners, 24 Castle Gate, Newark-on-Trent.

Welwyn R.D.C. Erection of 20 flats at Hawbush Common estate. Council's Surveyor, Council Offices, By-pass Rd., Welwyn.

Whitley Bay. A coach-building works and garage is to be built by G. Turk, Links Garage, on the Foxhunters' industrial site.

Whittlesey (Cambs.) U.D.C. M.o.H. has approved plans for erection of 158 houses.

Worthing. R.D.C. propose to build 52 houses at Lancing and Sompting, 18 at East Preston, 16 each at Angmering and Ferring, and 6 at Rustington.

OVERSEAS

Switzerland. The Union Carbide Europa S.A., Geneva, are anxious to obtain urgently offers of nickel anode, abrasives, flashlight bulbs, steel strapping and other commodities for manufacture of dry cell batteries.

U.S.A. Dave Rumph Co., Meacham Field, Fort Worth, in urgent need of transmitting and receiving valves and resistors.

MEETINGS TO NOTE

THURSDAY, OCT. 12

I.E.E. (London Utilization Section).—Chairman's Address. A. N. Irens. Savoy Place.—5.30 p.m.

I.E.E. (N. Midland Centre).—Chairman's Address. W. F. Smith. District meeting at Ferensway, Hull.—7.30 p.m.

DUNFERMLINE ELECT. SOC.—"Cable Fault Location." H. Walton. Unitas Hall, Queen Anne St.—7 p.m.

I.E.S. (Glasgow Centre).—"Coloured and Directional Light as Applied to the Stage." L. G. Applebee. 39 Elmbank Crescent.—6 p.m.

I.E.S. (Leicester Centre).—Presidential Address. L. J. Davies. E. Mid. Elect. Board, Charles St.—6.30 p.m.

I.E.S. (Manchester Centre).—"Recent Advances in Ophthalmology." D. L. Charters. Town Hall Extension.—6 p.m.

I.E.E. (Rugby Students' Section).—Chairman's Address. D. Bolton. E.M.E.B., Little Church St.—6.30 p.m.

INST. OF WORKS MANAGERS (Wembley Sub-Branch). — "Some Aspects of Works and Sales Co-operation." J. G. Christopher of G.E.C. Ltd. The Plough, Kenton Rd., Kenton.—12.30 p.m.

I.E.E. (N.E. Scotland Sub-Centre).—Chairman's Address. E. Wilkinson. Royal Hotel, Union St., Dundee.—7 p.m.

I.E.E. (W. Wales Swansea Sub-Centre).—Chairman's Address. J. Parker. Plaza Cinema.—6 p.m.

FRIDAY, OCT. 13

ELECT. POWER ENGRS. ASSOC. (Midland Tech. Group). "Supervisory Control." Messrs. Standard Telephones and Cables Ltd. Elect. Board's showrooms, Kingsway, Stoke, 7 p.m.

A.S.E.E. (Bristol Branch). "Use of Electricity in Coalmines." G. T. Vest. Grand Hotel, 7.30 p.m.

A.S.E.E. (Nottingham Branch). 'Fluorescent Lighting and the Maintenance Engineer." A. G. Mitchell. Elect. Showrooms, Smithy Row, 7.30 p.m.

ELECT. POWER ENGRS' ASSOC. (Midland tech. group).—"Electric Traction." Messrs. B.T.H. Co. Elect. Board Showrooms, Darlington St., Wolverhampton.

SATURDAY, OCT. 14

I.E.E. (N. Midlands Students').—"The 3-phase Induction-Motor and its Applications", Mr. Briggs. Y.E. Bd., Sunbridge Rd., Bradford.—2.30 p.m.

MONDAY, OCT. 16

I.E.E. (N.E. Radio Group).—Chairman's address. Prof. J. C. Prescott, Kings College, Newcastle.—6.15 p.m.

BIRMINGHAM ELECT. CLUB.—"Electronic Control of Heavy Motors and Generators." Dr. W. Wilson.

INSTN. OF WORKS MANAGERS (London branch).—Annual meeting at Waldorf Hotel.—6.45 p.m.

I.E.E. (Rugby Sub-Centre).—"British Overseas Railway Electrifications." E. T. Hippisley. Elect. Showrooms, High St.—6.30 p.m.

I.E.E. (London Discussion Circle).—"Armature Reaction in Alternators: How it should be Presented to Students." Savoy Place.—6 p.m.

I.E.E. (Mersey and N. Wales Centre).—"Education and Training of Electrical Technicians." F. T. Chapman. Liverpool Royal Instn., Colquitt St.—6.30 p.m.

A.S.E.E. (Central London branch).—"Fluorescent Lighting. Circuits and Maintenance." A. G. Mitchell. St. Ermins Hotel, S.W.1, 6.50 p.m.

A.S.E.E. (Stockport branch).—"Electric Vehicles." Mr. Tyrrel. White Lion Hotel, Underbank. 8 p.m.

TUESDAY, OCT. 17

INCORP. PLANT ENGNRS. (Glasgow Branch).—Lecture by official of Hydro-Elect. Board. Engineering Centre, 35 Sauchiehall St.—7 p.m.

I.E.E. (E. Midland Centre).—"Operation and Maintenance of Television Outside-Broadcast Equipment." T. H. Bridgewater. Gas Demonstration Theatre, Nottingham.—6.30 p.m.

I.E.E. (Cambridge Radio Group).—Chairman's address. F. H. Townsend. Cambridgeshire Tech. College.—6 p.m.

I.E.E. (N. Midland Utilisation Group).—"Evolution of the Lighting Art." J. W. T. Walsh. Lighting Service Bureau, 24 Aire St., Leeds.—6.30 p.m.

I.E.E. (N.W. Utilisation Group).—"Some Notes on Electrical Installations in Large Chemical Factories." D. B. Hogg. Engineer's Club, Albert Sq., Manchester.—6.15 p.m.

A.S.E.E. (Liverpool branch).—Presidential address. T. G. N. Haldane. London Lighting Service Bureau, Savoy Hill, W.C.2. 6.30 p.m.

WEDNESDAY, OCT. 18

I.E.E. (Southern Centre).—"Some Electrical Methods of Measuring Mechanical Quantities." F. J. Woodcock. University College, Southampton.—6.30 p.m.

I.E.S. (Tees-side Group).—"Lighting and the Visual Art of Play Production." P. Corry. Cleveland Scientific and Tech. Instn., Corporation Rd., Middlesbrough.

BRIT. INSTN. OF RADIO ENGRS. (London Section).—"Signal Sources for Television Testing." D. W. Thomasson. School of Hygiene, Gower St., W.C.1.—6.30 p.m.

I.E.E. (London Radio Section).—Chairman's address. C. F. Booth. Savoy Place.—5.30 p.m.

I.E.E. (Sheffield Sub-Centre).—Chairman's address. D. Harrison. Grand Hotel.—6.30 p.m.

INST. of HEATING AND VENTILATING ENGRS. (London Assoc. members and graduates section).—"Condensate and Flash Steam." B. Pheasant. 178-180 Edgware Rd., W.2. 6 p.m.

LUTON ELECT. SOC.—"Automatic and Remote Control as applied to Processes." R. S. Medlock, G. Kent Ltd., Biscot Rd. 7.30 p.m.

A.S.E.E. (Manchester branch).—"Modern Fixing Practice." R. P. Dunn. Engineers' Club, Albert Sq. 7.30 p.m.

A.S.E.E. (Coventry branch).—"Switchgear." Tech. College, The Butts. 7.15 p.m.

THURSDAY, OCT. 19

I.E.E. (E. Midland Centre).—"Overhead Lines." H. W. Grimmitt. White Hart Hotel, Spalding.—7 p.m.

I.E.E. (Irish Branch).—Chairman's address. P. G. Boyd. Trinity College, Dublin.—6 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (Birmingham branch).—"Notes on Fan Application, Installation and Maintenance." J. N. Bottrill. Imperial Hotel, 6.30 p.m.

INSTN. of HEATING AND VENTILATING ENGRS. (E. Midlands branch).—Annual dinner. Grand Hotel.

FRIDAY, OCT. 20

JNR. INSTN. OF ENGNRS.—"Fuel and Farm Mechanisation." H. W. Arkell. 39 Victoria St., S.W.1.—6.30 p.m.

ELECT. POWER ENGRS.' ASSOC. (Southern Meter Engrs.' Group).—"Evolution of the House Service Meter." L. J. Matthews. Caxton Hall, Westminster. 6.30 p.m.

BIRMINGHAM ELECT. CLUB.—Ladies' evening. Dinner, Dance at Grand Hotel, 7 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

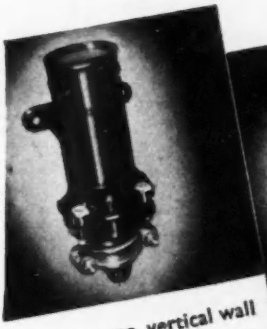
Accessories Electrical Supplies (Wholesale) Ltd., Offices of M. P. Goodrich and Co., 1 Hatton Garden, E.C.1. Cap.: £1,000. Dirs.: B. Russell, 9 Clapton Sq., E.5., R. A. Raphael, 10 Hadley Court, Cazenove Rd., N.16, A. Segal, 37 Brooklale, Arnos Grove, N.11.

J. W. H. Bethel Ltd., 4a Market St., Faversham, Kent. To take over bus. of J. W. H. Bethel, elec. engr, and contractor, cd. on at Faversham, Kent, by Joseph W. H. Bethel. Cap.: £2,000 Dirs.: J. W. H. Bethel and Mrs. F. M. Bethel.

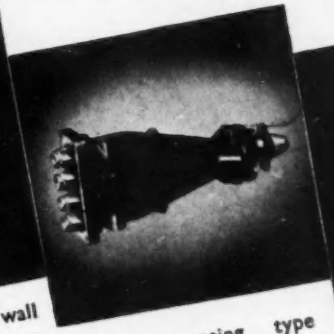
Eastwood and Lean Ltd., 28 Upper Richmond Rd., S.W.15. To carry on bus. of designers and mnfrs. of and dlrs. in all types of electronic, elec., mech., physical or chemical plant, etc. Cap.: £2,000. Permt. Dirs.: L. Eastwood and J. H. J. Lean.

Frank Marsland (Electrical) Ltd., To carry on bus. of elec. and genl. engrs., etc. Cap.: £2,000. Permt. Dirs.: F. Marsland, Grenda, Chester Rd., Hazel Grove, Ches., and F. Marsland junr., 19 Woodland Av., Hazel Grove, Ches.

Shearman Brothers (Chelmsford) Ltd., 66a Baddow Rd., Chelmsford. To carry on bus. of elec. engrs. and contractors, etc. Cap.: £300. Dirs.: A. J. Shearman and Mrs. E. E. Shearman.



Circular type, vertical wall mounting, for single core cable.



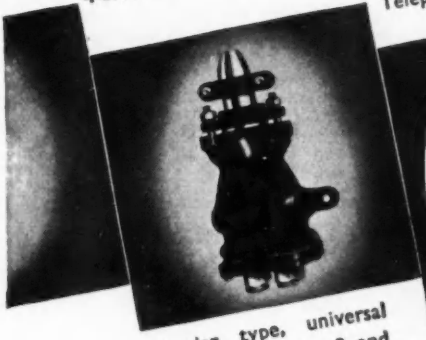
Flange mounting type (horizontal or inverted) for twin, 3 and 4-core cables.

Flat type, universal wall mounting, for twin, 3 and 4-core cables.

Flat type, vertical wall mounting for twin, 3 and 4-core cables.

Circular type, vertical wall mounting, for 3 and 4-core cables, and Signal, Pilot or Telephone Cables.

Flange mounting type (vertical) for twin, 3 and 4-core cables.



Circular type, universal wall mounting, for 3 and 4-core cables.

There's a HENLEY Indoor Terminal Box to suit every normal requirement, for working pressures up to 660 V. Please write for Catalogue 35.

HENLEY

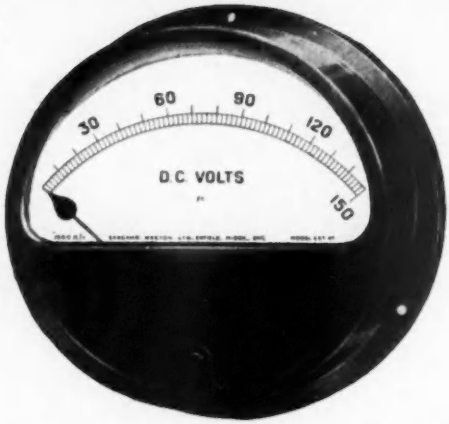
TERMINAL BOXES

W. T. Henley's Telegraph Works Co. Ltd., 51/53 Hatton Garden, London, E.C.1.

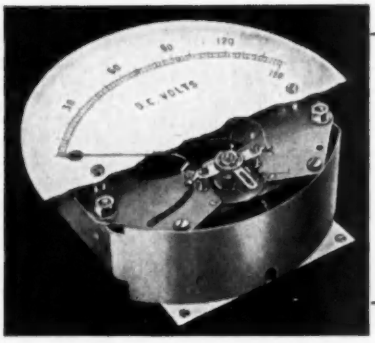
FEATURES OF WESTON SUPERIORITY

Weston

MOVING COIL SWITCHBOARD INSTRUMENTS



Combining the sensitivity of a laboratory instrument with the robust qualities of a switchboard pattern, this new series of 'Weston' permanent-magnet, moving coil instruments represents a great advance in design and technique. They incorporate thermocouples and rectifiers where necessary. Special features include efficient damping, the new standard 'Weston' patented spring-loaded jewel to protect the pivot, magnetic shielding and a high degree of accuracy. Mounted in attractive bakelite cases, flush fitting or projecting, the 6" easily read scale is printed in black on white enamel. All instruments conform to B.S.I. Spec. No. 89. Special enquiries will receive the personal attention of our Technical experts. The model S57 illustrated is supplied as a D.C. Microammeter, Milliammeter, Millivoltmeter, Ammeter and Voltmeter, all with a variety of ranges.



MAGNETIC SHIELDING. To prevent interference from external magnetic fields and to reduce those due to the instrument, it is magnetically shielded as shown. The high degree of accuracy of these instruments is in no small measure due to this 'Weston' design.

SANGAMO WESTON LIMITED

ENFIELD, MIDDLESEX.

Telephone: Enfield 3434 & 1242 - - - Telegrams: Sanwest, Enfield.

Branches: Glasgow, Newcastle-on-Tyne, Leeds, Manchester, Wolverhampton, Bristol, Southampton, and Brighton.

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CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 35s. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s

TENDERS INVITED

AIREBOROUGH URBAN DISTRICT COUNCIL

INSTALLATION OF FLUORESCENT STREET LIGHTING ON LEEDS ROAD BETWEEN NUNROYD, GUISELEY, AND RED BECK, RAWDON

Distance—2½ miles (approx.)

TENDERS are invited for the supply and installation of Fluorescent Street Lighting on Leeds Road between Nunroyd, Guiseley, and Red Beck, Rawdon, an approximate distance of two and a half miles. Separate tenders are invited as follows:—

1. Supply and erection of Reinforced Columns and Brackets and the fitting and wiring of Lanterns to column bases, etc.
2. Supply of Lanterns and all Auxiliary Gear.

A firm may tender for both, but the Council reserve the right to accept separate tenders from different firms.

Copies of the plan, instructions to persons tendering, specification, bills of quantities, forms of tender and schedule of rates and prices may be obtained from, and general conditions of contract seen at, the office of the Engineer and Surveyor to the Council at the address below on payment of a deposit of 2 gns., which will be returned on receipt of a bona-fide tender or the return of the documents.

Tenders, enclosed in a plain sealed envelope, endorsed "Tender for Street Lighting," must be delivered to the undersigned not later than Wednesday, December 13, 1950.

The Council does not bind itself to accept the lowest or any tender and the acceptance of a tender or tenders will be subject to the obtaining by the Council of any requisite consents.

RALPH H. HULME,
Clerk of the Council.

Council Offices,
Rawdon, near Leeds.
October 5, 1950. (G 336)

COUNTY BOROUGH OF HASTINGS

Secondary Modern School for 360 Girls
Red Lake, Ore

ELECTRICAL INSTALLATION

ELECTRICAL CONTRACTORS desiring to tender for the above installation are to submit their names to the Borough Engineer and Surveyor, 37 Wellington Square, Hastings, by October 17, 1950, with a deposit of £2 2s., which will be returned on receipt of a bona-fide tender together with all documents, etc.

The school consists of one building including: 9 Classrooms, 6 practical rooms, library, assembly hall, stage, etc., gymnasium, etc., kitchen dining-room, and boiler chamber.

Tenders, on the prescribed form, sealed in the envelope provided, to be returned to the undersigned not later than 2 p.m., on Wednesday, November 1, 1950, but not bearing any name or mark indicating the sender.

The Council do not bind themselves to accept the lowest or any tender.

N. P. LESTER,
Town Clerk.

Town Hall, Hastings. (G 312)

THE High Commissioner for Pakistan invites tenders from actual manufacturers for the supply of:—

CABLE ASSAULT

Forms of tender, which are returnable by November 14, 1950, may be obtained from The Commercial Secretary, Supply and Stores Department, 40 Lowndes Square, London S.W.1, between the hours of 10 a.m. and 4 p.m., Mondays to Fridays, on payment of a fee of 5s. (not returnable) per tender. The reference S.D. 7224 should be quoted on all applications for tender forms. (G 328)

COUNTY COUNCIL OF THE WEST RIDING OF YORKSHIRE

TENDERS are invited for the complete ELECTRICAL INSTALLATIONS in the following new schools:—

PONTEFRACT WILLOW PARK INFANTS' SCHOOL
CASTLEFORD AIREDALE (REDHILL) INFANTS' SCHOOL

Plans and specifications may be obtained on application to the County Architect, Bishopgarth, Westfield Road, Wakefield, not later than October 17, 1950, on payment of a deposit of £1 1s. in each case, which will be returned on receipt of a bona fide tender. Cheques must be made payable to the "West Riding Treasurer" and crossed "& Co."

The contract will be under the provisions of the R.I.B.A. Conditions and Form of Agreement.

Sealed tenders must be addressed to me, the undersigned, and received at Room 3, County Hall, Wakefield, not later than 10 a.m. on Monday, November 6, 1950. No tender will be received except in a plain sealed envelope, which must bear the words, "Tender—Electrical Installation" (followed by the name of the school). The envelope containing the tender must not bear any name or mark indicating the sender. No tender delivered later than the time appointed will be opened.

BERNARD KENYON,
Clerk of the County Council.

County Hall, Wakefield.
October, 1950. (G 321)

DERBYSHIRE COUNTY COUNCIL

STREET LIGHTING

TENDERS are invited for the provision and fixing of street lighting equipment on the Derby-Nottingham Trunk Road, A52, to illuminate the roundabout and approaches at the junction of Nottingham Road, A52, and Lodge Lane, B6001, Spondon. Copies of the drawing, conditions of contract, specification, quantities and form of tender may be obtained from the County Surveyor, County Offices, St. Mary's Gate, Derby, upon receipt of a deposit of £2 2/- which will be returned upon receipt of a bona-fide tender not subsequently withdrawn.

Tenders in plain sealed envelopes, endorsed "Tender for Street Lighting, Spondon Roundabout," should reach the offices of the Clerk of the County Council, St. Mary's Gate, Derby, not later than noon on October 27, 1950.

The Council do not bind themselves to accept the lowest or any Tender.

S. MEHEW,
County Surveyor.

County Offices,
St. Mary's Gate, Derby.
October, 1950. (G 72

APPOINTMENTS VACANT

SOUTH WALES ELECTRICITY BOARD

West Central Sub-Area

APPOINTMENT OF METER REPAIRER (MECHANICIAN)

APPLICATIONS are invited for the position of Meter Repairer (Mechanician) in the Sub-Area Meter Testing Station, Fforestfach, Swansea.

The duties will include the repairing of all types of quarterly and pre-payment meters, and overhauling of public lighting and shop-window lighting time switches.

The conditions of employment applicable to this appointment are as laid down by the National Joint Industrial Council for the electricity supply industry, the present rate of pay being 2s. 11d. per hour for a 44 hour, 5-day week.

Applications should be addressed to the undersigned so as to reach him within 14 days of the publication of this advertisement.

G. R. T. EDWARDS,
Sub-Area Manager.

Ystrad Road, Fforestfach, Swansea. (G 348)

SOUTHERN ELECTRICITY BOARD

APPLICATIONS are invited by the Southern Electricity Board for a post as TRAINING TUTOR in the Education and Training Section of the Secretary's Department, Southern Electricity House, Maidenhead.

The appointment will be for a probationary period of one year, in the first instance, and the salary will be in accordance with Grade 5 of the N.J.C. Agreement 1950 (£570-£653 per annum) according to qualifications and experience.

The duties of the post will include the conduct of supervisors' courses throughout the Board's area, and lectures on industrial relations at such other courses as may be arranged. Candidates must be skilled in discussion group technique, and a knowledge of the T.W.I. scheme of training is desirable. The possession of a University degree with teaching and industrial experience would be considered an advantage.

The successful candidate will, if and when eligible, be required to contribute to the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications should be made on a standard form obtainable from the undersigned and returned to him not later than 14 days after the appearance of this advertisement.

F. W. KEMPTON,
Secretary.
(G 347)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

REGIONAL ENGINEER (PROTECTION), COVENTRY SECTION OF THE TECHNICAL DEPARTMENT

APPLICATIONS are invited for the position of Regional Engineer (Protection) in the Coventry Region of the Divisional Technical Department.

Applicants, who should possess the regular National Certificate, or preferably a Degree in Electrical Engineering, must have had considerable experience in the testing and commissioning of protective gear.

The salary and conditions of service will be in accordance with the Revised National Joint Board Schedule, Class "AX," Grade 5, the salary range being from £579 to £710 per annum.

The appointment will be subject to the provision of the British Electricity and Area Boards' Superannuation Scheme.

Applications should be made on forms which may be obtained from the Divisional Establishments Officer, British Electricity House, Barker Gate, Nottingham, and should be returned not later than October 23, 1950.

W. S. BURGE,
Divisional Controller.
British Electricity House,
Barker Gate, Nottingham. (G 345)

BRITISH ELECTRICITY AUTHORITY

Merseyside and North Wales Division

APPLICATIONS are invited for the following posts at the Aberystwyth Diesel Power Station :—

(a) FITTER (ELECTRICAL)

Applicants must be competent to carry out erection and maintenance of h.v. and l.v. switchgear, and also carry out maintenance work on alternators, exciters and auxiliary equipment. The appointed person will be required to operate within the area covering Dolgelley, Towyn and Machynlleth Power Stations, but will be stationed at Aberystwyth.

(b) STOREKEEPER

Applicants should have a knowledge of engine parts and be able to keep records of all materials received and issued from stock.

Wages and conditions of service will be in accordance with the N.J.I.C. Agreement for the Electricity Supply Industry, the present rate being for (a) 35.00d. per hour, and (b) 31.75d. per hour.

Applications, stating age, qualifications and experience, should be addressed to the Divisional Secretary, British Electricity Authority, Merseyside and North Wales Division, Clarke Gardens, Woolton, Liverpool, to be received not later than Friday, October 20, 1950. (G 311)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

Edinburgh Sub-Area

APPLICATIONS are invited to fill vacancies as GENERAL ASSISTANT ENGINEERS in the Edinburgh Sub-Area, South East Scotland Electricity Board.

The salary will be in accordance with the National Joint Board Schedule for the Electricity Supply Industry, Grade "H.13," commencing at £458.

Previous experience of electrical distribution work is essential.

The positions are superannuable and successful applicants will be required to pass a medical examination.

Applications, in writing, stating age, education, qualifications, experience and present employment, should be received by the undersigned within fourteen days after the appearance of this advertisement.

G. T. ALLCOCK,
Edinburgh Manager.
(G 313)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the position of MECHANICAL MAINTENANCE ENGINEER at Earley Generating Station, Reading.

Applicants should have a wide experience in the maintenance of generating station power plant and be capable of taking control of a large maintenance staff, machine shop, and supervising turbine and boiler overhauls.

Candidates should preferably be corporate members of the Institution of Electrical or Mechanical Engineers or have equivalent qualification.

The conditions of service will be those approved by the N.J.B. and the salaries will be in accordance with Class "G," Grade 6, viz., £707 to £737.

Application forms can be obtained from the undersigned and should be returned to the address given below not later than October 27, 1950.

P. D. A. OLIVER,
Divisional Secretary.
British Electricity House,
High Street, Portsmouth. (G 362)

BRITISH ELECTRICITY AUTHORITY

South Western Division

SHIFT CHARGE ENGINEER—FEEDER ROAD POWER STATION

APPLICATIONS are invited for the position of Shift Charge Engineer at Feeder Road Power Station, Class "E," Grade 7, £579 to £609 per annum.

Applicants should have good technical experience, a sound knowledge of the operation and maintenance of generating plant, and preference will be given to applicants possessing the Higher National Certificate or equivalent qualification.

The appointment will be superannuable under the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications, stating age, qualifications, experience, present appointment and salary, should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26 Oakfield Road, Bristol 8, so as to be received not later than October 23, 1950.

R. C. BARRETT,
Divisional Secretary.
October 5, 1950. (G 342)

BRITISH ELECTRICITY AUTHORITY

Merseyside and North Wales Division

BROMBOROUGH POWER STATION

APPLICATIONS are invited for the position of STATION CLERK at Bromborough Power Station, which will shortly be commissioned and will have an ultimate capacity of 200 MW.

Applicants must have had previous power station experience, and should have an extensive knowledge of:

Fuel recording, stores systems, operation records and statistics, wages records and conditions of service, invoice procedure and general clerical work at stations.

The salary for the post (which is superannuable and subject to a satisfactory medical examination) is Grade 4 (£510-£570) of the N.J.C. Agreement.

Forms of application may be obtained from the Divisional Secretary, British Electricity Authority, Merseyside and North Wales Division, Clarke Gardens, Woolton, Liverpool, and should be returned to him not later than Monday, October 23, 1950.

A. R. COOPER,
Divisional Controller
(G 363)

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of BRANCH MANAGER, St. Ives, in the Cornwall Sub-Area, at a provisional commencing salary of £519 p.a. (Class "E," Grade 9 of N.J.B. Salary Schedule A). The grading is subject to confirmation.

Candidates must possess sound commercial knowledge and have had engineering experience; qualifications leading to graduate or corporate membership of the I.E.E., will be an advantage.

The successful applicant will be responsible for the efficient management of the branch (21 square miles in area, with 3,400 consumers) including sales promotion, consumers' services, contracting, installation of services including testing and connection of wiring, meter reading, fixing and removing, supervision of all branch employees. He will be required to operate the l.v. distribution system, and to undertake h.v. switching operations.

Detailed applications, stating age, qualifications and experience, present position and salary, to be submitted to District Manager, West Cornwall District, South Western Electricity Board, 29 Causewayhead, Penzance, Cornwall, within ten days. (G 365)

NORTH WESTERN ELECTRICITY BOARD

No. 3 Sub-Area

APPOINTMENT OF GENERAL ASSISTANT DISTRICT ENGINEER

APPLICATIONS are invited for the position of General Assistant District Engineer in the 3A (Oldham) District of the No. 3 Sub-Area.

The provisional salary will be in accordance with the National Joint Board Revised Schedule, Class "F," Grade 10, i.e., £510/£520/£530 per annum. This is subject to approval by the District Joint Board and National Joint Board.

The engineer appointed will be required to give general assistance to the District Engineer and his senior staff with relation to the following:—

Operation and maintenance of high- and low-voltage networks (overhead and underground).
Operation and maintenance of sub-stations.
Any necessary constructional work.
The keeping of technical records.
General maintenance of supply and such other matters as may be necessary.

The successful candidate will be required to undertake standby duty.

Applications, stating age, experience, and qualifications, present post and salary, should be received by E. Binns, M.I.Mech.E., A.M.I.E.E., Sub-Area Manager, The North Western Electricity Board, No. 3 Sub-Area Headquarters, Union Street, Oldham, not later than Saturday, October 28, 1950. (G 343)

SOUTH WESTERN ELECTRICITY BOARD

(Bath District)

LINESMEN (OVERHEAD POWER)

APPLICATIONS are invited for the appointment of Linesmen (Overhead Power) in the Bath District of the Bristol Sub-Area. Experience in the erection and maintenance of low- and high-voltage electricity supply is essential. Wages and conditions of service in accordance with N.J.I.C. Agreement for Electricity Supply Industry (present rate 34.00d. per hour).

Applications, stating age, present position, and previous experience, should be forwarded to the District Manager, Old Bridge, Bath, to be received not later than Monday, October 23, 1950.

A. G. MILNE,
District Manager.

South Western Electricity Board,
Old Bridge, Bath.
October 5, 1950. (G 360)

MIDLANDS ELECTRICITY BOARD

South Staffs. & North Worcs. Sub-Area

APPOINTMENT OF FIRST ASSISTANT DISTRICT ENGINEER

APPLICATIONS are invited for the above position in the Bilston District of the South Staffs and North Worcestershire Sub-Area.

Applicants must have had experience in all branches of distribution work, including operation and maintenance of high- and low-voltage cables, overhead lines, sub-stations, etc.

Appropriate technical qualifications will be considered an advantage.

Conditions of service will be in accordance with the National Joint Board Agreement, and the salary will be in Class "E," Grade 5, £662 per annum.

Applications, stating age, present salary, full particulars of qualifications, experience, and present position, should be endorsed "First Assistant District Engineer" and forwarded within 14 days to Mr. T. G. Keeler (Ref. CW), Manager, South Staffs and North Worcs. Sub-Area, Midlands Electricity Board, Toll End Road, Tipton, Staffs.

A. STEPHENS,
Secretary.

October 6, 1950. (G 361)

SOUTHERN ELECTRICITY BOARD

No. 2 (Newbury) Sub-Area

AGRICULTURAL REPRESENTATIVE (Swindon District). Salary: £450 to £510 per annum. Grade: Provisional. Qualifications: Sound knowledge of the application of electricity in agriculture and horticulture, capable of preparing estimates for wiring installations and equipment and conducting negotiations. Ability to give talks to agricultural organisations will be an advantage.

The successful candidate will, if eligible, be required to join the B.E.A. and Area Board's Superannuation Scheme, membership of which is compulsory.

Applications should be made on a standard form, obtainable from the Sub-Area Secretary, and returned to him at 7 Oxford Road, Newbury, within 10 days of the appearance of this advertisement.

F. W. KEMPTON,
Secretary.
(G 359)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

Chief Engineer's Department

APPLICATIONS are invited for an ASSISTANT ENGINEER in the planning and development section of the Chief Engineer's department at headquarters.

Candidates should have obtained the Higher National Certificate in electrical engineering or an equivalent qualification, and should have had experience in the planning of new and extensions to existing 33 kV and lower voltage distribution systems.

The duties will include the carrying out of all necessary system calculations, and the preparation of reports and estimates. Experience in the operation and maintenance of distribution systems, sub-station design, and the application of modern protective gear technique is desirable.

The salary for the post will be in accordance with the National Joint Board Revised Agreement, Grade 2, Class "AX/BX," and will commence at a point within the range £752-£911 per annum depending upon qualifications and experience. The appointment is superannuable.

Applications, giving age, qualifications, experience, present position and salary, should be addressed to the Chief Engineer, South East Scotland Electricity Board, 52 Melville Street, Edinburgh 3, so as to reach him not later than Saturday, October 28, 1950.

THOMAS J. MULLAN,
Secretary.

South East Scotland Electricity Board,
52 Melville Street, Edinburgh 3. (G 369)

HONG KONG ELECTRIC COMPANY LIMITED

APPLICATIONS are invited for the position of MAINS ASSISTANT. Salary, Hong Kong $750 per month. Must have experience of electrical distribution systems, including e.h.t. cable jointing.

First contract would be for three years, with prospects of future employment at an increased salary. Applicants should be about 25 years of age and preferably unmarried.

There is at present a high-cost-of-living allowance of Hong Kong $600 per month (Hong Kong $ equals 1s. 3d. approximately), in addition to above salary.

Free passages to and from Hong Kong. Free quarters and medical attendance. Staff provident fund. Eight months' leave on full pay, with free passages, after five years' service, thereafter leave is given every four years on similar conditions.

Applications, stating age, if single, particulars of training and experience, enclosing copies of testimonials, should be sent in writing to the Representative of the Hong Kong Electric Co., Ltd., 122 Leadenhall Street, London E.C.3. (G 323)

BRITISH ELECTRICITY AUTHORITY

London Division

DEPTFORD EAST GENERATING STATION—SHIFT CHARGE ENGINEER

APPLICATIONS are invited for this position from candidates who have received a sound electrical and mechanical training, and with experience in the operation of power station electrical plant, and in the efficient operation and control of high pressure boiler and turbine plant.

The engineer appointed will be required to take full charge of the station operation during his shift of duty.

Salary in accordance with the revised National Joint Board Schedule Class "G," Grade 7 plus London allowance, =£683 11/- per annum. (The classification of this station under Class "H" is under review.)

Applications, stating age, qualifications and experience, should be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, and be received within 14 days of the appearance of this advertisement.

J. N. WAITE,
Divisional Controller.
(G 370)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for a CLERICAL ASSISTANT on the staff of the Divisional Secretary.

Conditions of service will be those approved by the National Joint Council for the Electricity Supply Industry and the salary will be in accordance with Grade 3 (£450 to £510).

Applicants should have had experience of establishment work, preferably in the electricity supply industry, particularly in the appointment of staff, personal records, and the preparation and interpretation of staff trees. A working knowledge of the British Electricity Authority Establishment circulars will be an advantage.

Application forms can be obtained from the undersigned and should be returned to the address given below not later than October 27, 1950.

P. D. A. OLIVER,
Divisional Secretary.

111 High Street, Portsmouth. (G 363)

HIS MAJESTY'S COLONIAL SERVICE

A VACANCY exists for an ELECTRICAL ENGINEER in the Public Works Department, Sierra Leone. Salary within the scale of £750 to £1,300 per annum; in addition a cost-of-living allowance of £60 to £125 per annum, depending on salaries, is payable. The post is pensionable and starting salary depending on age, qualifications, experience, and war service, but candidates should not be more than 40 years of age.

Candidates must be corporate members of the Institution of Electrical Engineers or hold equivalent qualification and should have served an electrical engineering apprenticeship and have a thorough knowledge of generation and distribution in an electricity supply undertaking and some mechanical experience in a power station is important. Must have sound experience in construction and maintenance of h.t. and l.t. distribution systems and in administration of an electricity undertaking. Experience in steam turbines and or diesel engines an advantage.

The general qualifications and experience must be such as to enable the officer to act for the Chief Electrical Engineer when the latter proceeds on leave.

Furnished quarters at rents of £60 to £90 per annum and free first-class passages each way each tour for the officer and his wife and family are provided. Home leave on full pay at the end of each tour of 18 months, at the rate of seven days for each month of resident service. Income tax at local rates.

Intending candidates should write for application form to the Director of Recruitment (Colonial Service), Sanctuary Buildings, Great Smith Street, S.W.1, giving brief particulars of age, qualifications, and experience, and quoting reference No. 27326/3. (G 338)

NORTH WESTERN ELECTRICITY BOARD

No. 5 Sub-Area

APPOINTMENT OF SECOND ASSISTANT DISTRICT ENGINEER, ROSSENDALE DISTRICT

APPLICATIONS are invited for the appointment of Second Assistant District Engineer in the Rossendale District of the No. 5 Sub-Area.

The provisional salary will be in accordance with the National Joint Board Revised Schedule, Class "E," Grade 7, i.e., £579 £594 (£679 per annum. This is subject to approval by the District Joint Board and the National Joint Board.

The successful candidate will be required to assist in the operation, maintenance, and construction of underground and overhead mains, sub-stations, and transformers, and general mains duties, and to undertake standby duties.

Preference will be given to candidates who are corporate or graduate members of the Institution of Electrical Engineers, or who possess the Higher National Certificate in Electrical Engineering.

Applications, stating age, qualifications, and experience, present position and salary, should be received by R. H. Harral, M.I.E.E., M.Inst.F., Manager, No. 5 Sub-Area, The North Western Electricity Board, Jubilee Street, Blackburn, not later than Saturday, October 28, 1950. (G 344)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPOINTMENT OF JUNIOR ENGINEER AND JUNIOR DRAUGHTSMAN, CHESTER

APPLICATIONS are invited for the following appointments on the engineering staff in the Chester District of No. 3 Sub-Area :—

(a) JUNIOR ENGINEER

Salary £375 per annum, in accordance with Grade 14, Classification "E" of the National Joint Board Agreement. Applicants must have received a thorough technical training and obtained the Higher National Certificate in Electrical Engineering or equivalent qualification, and possess some experience in the design, construction and operation of h.v. networks, substations and MV networks up to and including 6.6 kV.

(b) JUNIOR DRAUGHTSMAN

Salary in accordance with the General Clerical Scale of the National Joint Council, i.e. £228 p.a. at 21 years of age, rising to £310 p.a. at 26 years of age, and thence within the scale £310 £385 p.a. according to qualifications, service and experience. Applicants should have had experience in the preparation of drawings, preferably of an electrical nature, and the copying of maps and other records.

The appointments are superannuable, and subject to a satisfactory medical examination.

Applications must be made on a form obtainable by written request from the Manager, Merseyside and North Wales Electricity Board, No. 3 Sub-Area, Electricity House, Newgate Street, Chester, and should be returned to him in a sealed envelope, endorsed with the title of the appointment sought, so as to be received not later than October 30, 1950.

JAMES RANKIN,
Secretary.
(G 310)

MUNICIPALITY OF SINGAPORE

Municipal Engineer's Department

APPLICATIONS invited for appointment of ASSISTANT ENGINEER (ROADS) on permanent staff.

Qualifications: University degree in civil engineering or Section A and B of Inst. C.E. examination or Inst. Mun. E. testamur. Preference to associate members. Applicants should have served articles under a chartered civil engineer. Two years' experience in municipal engineer's office an advantage. Age 24 to 28 and preferably unmarried.

Basic salary scale $500 per month to $1,000 per month. Starting point according to experience and qualifications. Graduated scale of allowances, e.g., present allowances on basic salary of $560 p.m. amount to: Expatriation $110 p.m., plus cost of living, $192 p.m. for single man or $246 p.m. for married man, or $318 p.m. for married man with family. (One Malayan dollar equals 2s. 4d.) Thus a married man with family on basic salary of $560 p.m. would draw equivalent of £1,383 per annum.

Quarters with heavy furniture, provided at rental of 8 per cent. of salary or allowance in lieu. Initial engagement on three years' agreement; eight months' leave after four years' service. Free medical attention. Passages paid, including family (children under 17 years). Compulsory provident fund contribution 7½ per cent. of salary and Municipal Commissioners donate 7½ per cent., rising to 20 per cent. after 20 years' service.

Applications, in duplicate, with full personal and technical information and copies of three testimonials, to Messrs. Peirce and Williams (Agents to the Municipal Commissioners), 1 Victoria Street, London S.W.1, before Wednesday, November 8, 1950. (G 324)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS are invited for the following appointments in the Technical Department at Divisional Headquarters, at salaries in accordance with the Revised National Joint Board Agreement, Class "AX/CX," Grade 8 (£437 to £674 per annum), the commencing salary to depend on qualifications and experience.

1. GENERAL ASSISTANT ENGINEER (TELECOMMUNICATIONS)

Applicants should have had practical experience in the repair and maintenance of telecommunication equipment.

2. GENERAL ASSISTANT ENGINEER

Applicants should preferably have had experience in the manufacture of electrical equipment and in the commissioning and testing of electrical equipment in generating stations. Experience on protective gear would be regarded as an advantage.

Candidates for both appointments should possess the Higher National Certificate or its equivalent.

The appointments will be superannuable under the British Electricity Authority and Area Boards Scheme.

Forms of application may be obtained from the Divisional Secretary at the address below, to whom completed applications should be returned not later than October 30, 1950, in sealed envelope endorsed with the appointment sought.

H. V. PUGH,
Divisional Controller.

Cardiff (Pengam Moors) Airport,
Cardiff.
October 5, 1950. (G 349)

BRITISH ELECTRICITY AUTHORITY

Contracts Department

SENIOR ASSISTANT

APPLICATIONS are invited for the post of Senior Assistant in the contracts department at the Authority's Headquarters in London, to deal primarily with mechanical engineering contracts.

The salary for this appointment, which is superannuable, will be within the range of £900-£1,100 according to qualifications and experience. This range is provisional and subject to negotiation within the appropriate negotiating machinery.

Candidates should be fully qualified to deal with all stages of the procedure involved in the placing of major contracts for mechanical engineering plant and equipment, including the critical assessment of tenders and the preparation of contract documents.

Applicants will be expected to have had extensive commercial experience of the class of contracts placed by the authority and of the manufacturing industries which supply the authority, and should possess sufficient technical background to enable them to appreciate the commercial significance of the technical aspects of the specifications and tenders with which the department is concerned. Negotiating experience in the placing of contracts of substantial magnitude is an essential qualification.

Letter of application, giving age, present position, and full details of qualifications and experience, should be forwarded to Mr. D. Moffat, Director of Establishments, British Electricity House, Great Portland Street, London W.1, to be received not later than October 30, 1950.

Please quote reference AE.109. (G 367)

SOUTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the Kent Sub-Area:

DISTRICT ENGINEER, Canterbury/Herne Bay/Whitstable District. Salary of £732 p.a. to £760 p.a. Class "D," Grade 3.

DISTRICT ENGINEER, Sittingbourne/Sheerness/Faversham District. Salary of £732 p.a. to £760 p.a. Class "D," Grade 3.

DISTRICT ENGINEER, Thanet District. Salary of £732 p.a. to £760 p.a. Class "D," Grade 3.

DISTRICT ENGINEER, Gravesend District. Salary of £775 p.a. to £809 p.a. Class "E," Grade 3.

The above salaries are under the revised N.J.B. schedule. Superannuation will be arranged. Applicants must have had considerable experience in all branches of distribution work, including the operation and maintenance of high and low voltage cables, switchgear, transformers, overhead lines, sub-stations, protective gear, etc. Appropriate technical qualifications an advantage.

Applications, giving two referees, must reach H. F. Knell, Esq., J.P., M.I.E.E., Kent Manager, South Eastern Electricity Board, 178/184 High Street, Rochester, Kent, within ten days from today.

West Kent District

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER

Salary of £627 p.a., plus London addition, under Class "E," Grade 6 of the N.J.B. Schedule. Superannuation will be arranged. Applicants to be qualified engineers with experience in the commercial department of an electricity undertaking covering service to all classes of consumers. The person appointed will assist the District Commercial Officer in the control and organisation of the department.

Applications, giving two referees, must reach P. S. Watson, Esq., A.M.I.E.E., M.I.I.A., West Kent Manager, South Eastern Electricity Board, 270 High Street, Orpington, Kent, with ten days from today.

A. L. BURNELL,
Secretary.

October, 1950. (G 364)

UGANDA ELECTRICITY BOARD

APPLICATIONS are invited for the undermentioned appointments in connection with the electrical development of Uganda, East Africa. Uganda has a mean temperature ranging between 58 degrees F. and 92 degrees F.

LINESMEN, with experience of the erection and maintenance of wood pole lines up to 33 kV.

CABLE JOINTER, experienced in jointing up to 11 kV.

The successful applicants will be required to work on new construction works and on the maintenance of the Board's existing system; they will also be required to carry out other duties, such as the installation of transformers and erection of switchgear, and to train African linesmen and cable jointers.

Salary will be in the scale £580 by £40 to £780, the point of entry depending upon the candidate's experience.

Rent-free, partly furnished quarters will be provided or an allowance paid in lieu thereof. Free medical and dental services are provided. First contract will be for three years, with 90 days' vacation leave (or 180 days if contract is renewed) on full salary. Local leave may also be granted up to a total of 36 days during the period of the contract. The candidates selected would be required to join the Board's Provident Fund Scheme. A free passage will be provided for each selected candidate and, if married, for his wife and children under 18 years of age (up to a maximum of one adult fare in respect of children).

Forms of application may be obtained by sending a stamped addressed envelope, foolscap size, to the London Office of the Uganda Electricity Board, 129 Grand Buildings, Trafalgar Square, London W.C.2.

C. R. WESTLAKE,
Chairman.

P.O. Box 750, Kampala, Uganda. (G 358)

LONDON ELECTRICITY BOARD

ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for experienced Engineering Draughtsmen in the Drawing Office of the Engineering Department at Head Office in Central London.

Applicants should preferably have served an engineering apprenticeship or recognised training course and have had good technical training, together with experience in the layout of plant for major sub-stations, including transforming plant, switchgear, and cables for operation on voltages up to 66 kV. A knowledge of modern protective systems would be an advantage.

Pending grading of the posts under the national agreement of the appropriate negotiating body, commencing salaries will be from £500 per annum, dependent upon qualifications and experience.

Application forms, obtainable on receipt of an addressed foolscap envelope, from Establishments Officer, 46 New Broad Street, E.C.2, to be returned not later than October 21, 1950, quoting reference EST/V/996/T on envelope and all correspondence. (G 357)

HIS MAJESTY'S COLONIAL SERVICE

A VACANCY exists for an ELECTRICAL ENGINEER, Special Temporary Staff Public Works Department, Uganda Protectorate. The appointment is on contract/gratuity terms for a tour of 30 to 36 months, at a salary between £655 and £1,320 per annum, depending on qualifications and experience. A gratuity at the rate of 15 per cent. of nine-tenths of total emoluments will be payable on satisfactory completion of a tour of service. The contract is renewable, by mutual agreement, with a possibility of being absorbed into the permanent and pensionable establishment.

Candidates must be associate members of the Institution of Electrical Engineers, age 25 to 35 years. The officer will be responsible for the installation of electrical services in Government buildings and workshops, etc., and carry out inspection of installations under the Electricity Ordinance.

If Government quarters are occupied, a deduction of 10 per cent. of the salary or, if at a hostel, 5 per cent. of the salary, is made for rent. Free first-class passages for officer, his wife and children, up to three adults fares, in all. Free medical attention. Home leave after three years at the rate of five days for each month of residential service. Outfit allowance of £30 is payable on first appointment.

Intending candidates should apply for further particulars and application form to the Director of Recruitment, Sanctuary Buildings, Great Smith Street, S.W.1, giving brief details of age, qualifications, and experience immediately, quoting reference No. 27326/28. (G 337)

BRITISH ELECTRICITY AUTHORITY

Chief Engineer's Department—Headquarters

GENERATION DESIGN

APPLICATIONS are invited for ENGINEERING APPOINTMENTS in the Station Development, Outline Design, and District Heating Sections of the Generation Design Branch of the Chief Engineer's Department at Headquarters in London.

The duties to be performed are briefly set out below:—

1. STATION DEVELOPMENT.—The general design and development of the Authority's power stations and planning of the location of new power stations, having regard to location of load, supplies of fuel and cooling water, requirements of Government departments, local and other interested authorities; the co-ordination at Headquarters of the evaluation and selection of station sites, together with the co-ordination of economic studies related to stations designed to use new steam, gas, or combined steam and gas cycles.

2. OUTLINE DESIGN.—The general design of power stations to ensure economy and uniformity of the layout of main and auxiliary plant, workshop, stores, administrative and welfare services in buildings requiring a minimum of structural steel and other materials for construction; the outline design and layout of circulating water cooling, coal and ash handling, and electrical services; the supervision of consulting engineers and co-operation with other sections in carrying out economic studies related to stations designed to use new steam, gas, or combined steam and gas cycles, etc.

(a) Candidates for senior positions in 1 and 2 above should possess an honours degree and/or the requisite qualifications for corporate membership of the Institution of Mechanical Engineers or the Institution of Electrical Engineers, and should have sound experience of power station design work and, preferably, of the problem of siting power stations.

(b) Candidates for junior positions in 1 and 2 above should possess an engineering degree and should preferably have had operating experience in power stations or heavy plant manufacturing industries.

3. DISTRICT HEATING.—To conduct investigations into and assist in the design of thermal electric generating stations for district heating schemes; the assessing of the necessary installed plant capacities from consideration of heat and electrical load curves and preparing estimates of capital and running costs. Candidates should possess an honours degree and/or the requisite qualifications for corporate membership of the Institution of Mechanical Engineers or the Institution of Electrical Engineers and should have a sound experience of power station design work incorporating back pressure turbine plant.

Salaries will be within ranges from £490 to £1,750 per annum, in accordance with ability, experience, qualifications and responsibility, and the appointments will be superannuable.

A number of the appointments will be made in accordance with the appropriate grade under the National Joint Board Agreement. Appointments to the senior posts will, however, be made within salary ranges which are provisional and subject to negotiation.

Letters of application, stating the section in which the candidate is seeking an appointment, and giving age, present position, and full details of qualifications and experience, should be forwarded to Mr. D. Moffat, Director of Establishments, British Electricity House, Great Portland Street, London W.1, to be received not later than October 30, 1950. Please quote reference AE 104. (G 340)

BRITISH ELECTRICITY AUTHORITY

Chief Engineer's Department—Headquarters

GENERATION DESIGN

APPLICATIONS are invited for ENGINEERING APPOINTMENTS in the Reinforced Concrete and Soil Mechanics Sections of the Generation Design Branch of the Chief Engineer's Department in London.

The duties to be performed are briefly set out below.

1. REINFORCED CONCRETE.—The general design and critical examination of reinforced concrete work involved in the substructures and superstructures of main power station buildings and their associated circulating water pump houses, electrical switch houses, workshop, store and administrative buildings; of reinforced concrete circulating water culverts, tunnels, river inlet and discharge works, etc.

Candidates for senior positions should be Corporate Members of the Institution of Civil Engineers and have had a wide experience in the design and construction of reinforced, mass and pre-stressed concrete work associated with power stations.

Candidates for junior positions should possess an engineering degree and should preferably have had experience in the offices of a consulting engineer dealing with this class of work.

Salaries will be within ranges from £490 to £1,500 per annum in accordance with ability, experience, qualifications and responsibility and the appointments will be superannuable. A number of the appointments will be made in accordance with the appropriate grade under the National Joint Board Agreement. Appointments to the senior posts will, however, be made within salary ranges which are provisional and subject to negotiation.

2. SOIL MECHANICS.—The critical examination of subsoil conditions at power station sites by means of test bores of supersonic wave sounding apparatus; the undertaking of geological surveys associated with the construction of large river or estuary works, and collaboration with the National Coal Board relating to pillars of support in colliery districts.

Candidates should possess an honours degree and/or the requisite qualifications for corporate membership of the Institution of Civil Engineers, and should have sound experience in survey work associated with steam or hydro power station construction.

The salary for this appointment will be within the range of £1,000 to £1,500 per annum in accordance with ability, experience, qualifications and responsibility, and will be superannuable. The salary will be provisional until the final scales have been agreed with the appropriate negotiating organisations.

Letters of application, stating the section in which the candidate is seeking an appointment, and giving age, present position, and full details of qualifications and experience, should be forwarded to Mr. D. Moffat, Director of Establishments, British Electricity House, Great Portland Street, London W.1, to be received not later than October 30, 1950. Please quote reference AE.105. (G 341)

LONDON COUNTY COUNCIL

Chief Engineer's Department

APPLICATIONS are invited for positions of (a) TECHNICAL ASSISTANTS and (b) JUNIOR TECHNICAL ASSISTANTS. Applicants for (a) should have Higher National Certificate or equivalent in electrical engineering and should have had experience in preparing specifications for electrical installations in buildings. Applicants for (b) should have had good practical experience in electrical installation work and should hold Ordinary National Certificate.

Salaries: (a) Up to £580 a year; (b) up to 167s. 6d. a week, according to qualifications and experience. Positions pensionable with prospects of advancement for suitable candidates.

Application forms, obtainable by sending stamped addressed foolscap envelope to the Chief Engineer, County Hall, Westminster Bridge, S.E.1, quoting Vacancy No. 50 39, returnable in 14 days after the appearance of this advertisement.

Canvassing disqualifies. (1286). (G 346)

BRITISH ELECTRICITY AUTHORITY

North Western Division

APPLICATIONS are invited for the positions of JUNIOR ENGINEERS to assist Station Shift Control Engineers at the new Agecroft generating station, Pendlebury, near Manchester, the present capacity of which is 105 MW but ultimately will be 210 MW.

There are five vacancies, and the salaries for the posts which are superannuable, will be in accordance with Grade 16, Class "G," rising subject to satisfactory service to Grade 14, i.e. £375 to £428 per annum, based on the present capacity.

Candidates should preferably possess technical qualifications, and experience in a modern generating station is desirable.

Applications, stating age, present position, and giving full details of education, qualifications and experience, should be received by the Establishment Officer, British Electricity House, Wilmslow Road, East Didsbury, Manchester 20, not later than October 21, 1950. (G 345)

BRITISH ELECTRICITY AUTHORITY

Chief Engineer's Department—Headquarters

GENERATION DESIGN

APPLICATIONS are invited for ENGINEERING APPOINTMENTS in the Plant Design Section of the Generation Design Branch of the Chief Engineer's Department at headquarters in London.

The duties to be performed are associated with the design of the plant components in the various sub-sections briefly enumerated below:—

1. BOILERS: (a) combustion equipment and furnace design; (b) pressure parts, including superheaters; (c) heat recovery plant, economisers and air heaters; (d) draught and service fans, mechanical and electrical grit-arresting plant.
2. TURBINES: (a) steam and gas plant; (b) governor gear and lubrication system; (c) condensing, feed heating de-aerating and evaporating plant; (d) boiler feed, circulating water and miscellaneous service pumps.
3. ELECTRICAL: (a) generators, auxiliaries and motors; (b) transformers, switchgear and protection, cabling, lighting and heating, etc.
   GENERAL AND CO-ORDINATION: (a) station piping and valves; (b) instruments and auto control gear; (c) fire-fighting and water-treatment plant, etc.; (d) cooling towers.
   HANDLING: (a) coal handling and drying plant; (b) ash and dust handling plant; (c) cranes, lifting tackle, workshop equipment, etc.

Candidates for senior positions should possess an Honours Degree and/or the requisite qualifications for Corporate Membership of the Institution of Mechanical Engineers or the Institution of Electrical Engineers, together with recent experience in the design departments of manufacturers of the appropriate types of Central Power Station plant, and be capable of conducting technical investigations and preparing specifications.

Candidates for junior positions should possess a Degree in Engineering and preferably a practical training in the operation of power stations or with manufacturers of heavy power station plant.

Salaries will be within ranges from £490 to £1,750 per annum in accordance with ability, experience, qualifications and responsibility and the appointments will be superannuable. A number of the appointments will be made in accordance with the appropriate grade under the National Joint Board Agreement. Appointment to the senior posts will, however, be made within salary ranges which are provisional and subject to negotiation.

Letters of application, stating the sub-section in which the candidate is seeking an appointment, and giving age, present position, and full details of qualifications and experience, should be forwarded to Mr. D. Moffat, Director of Establishments, British Electricity House, Great Portland Street, London W.1, to be received not later than October 30, 1950. Please quote reference AE: 106. (G 339)

BRITISH ELECTRICITY AUTHORITY

Contracts Department

SENIOR ASSISTANT

APPLICATIONS are invited for the post of a Senior Assistant in the contracts department at the Authority's Headquarters in London to act as Chief Clerk.

The commencing salary for the appointment, which is superannuable, will be in accordance with Grade 9 of the National Joint Council Agreement, £940 per annum by £40 to £1,060 per annum including London allowance.

Candidates should be fully qualified to deal with all stages of the procedure involved in the placing of major contracts for generation and transmission plant and equipment, particularly in respect of terms and conditions of contract, price variation clauses and similar matters but excluding the consideration of matters relating to price.

The successful applicant will be in control of a general office and will be expected to handle a large volume of documents with accuracy and expedition.

Applicants will be expected to have extensive commercial experience, preferably of the class of contracts placed by the authority and of the manufacturing industries which supply the authority, and should have had experience in the control of a general office responsible for the receipt, recording, examination, filing, etc., associated with the placing of a large volume of contracts, together with the preparation of returns and schedules and the keeping of various records.

Letters of application, giving age, present position, and full details of qualifications and experience, should be forwarded to D. Moffat, Director of Establishments, British Electricity House, Great Portland Street, London W.1, to be received not later than October 30, 1950.

Please quote reference AE.110. (G 368)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

NORTH WESTERN ELECTRICITY BOARD

No. 5 Sub-Area

APPLICATIONS are invited for the following appointments in the Sub-Area Consumers' Engineer's Department, No. 5 Sub-Area, Jubilee Street, Blackburn.

SECOND ASSISTANT ENGINEER, Power Sales, at Sub-Area H.Q.

Candidates should have experience in the utilisation of electricity in industry with particular reference to textile and engineering industries. Experience of change-over from d.c. to a.c., and street lighting is desirable. Corporate membership of the Institution of Electrical Engineers would be an advantage.

The salary will be in accordance with the National Joint Board Revised Schedule, Class "H", Grade 7, i.e. £692 to £707 to £722 per annum.

GENERAL ASSISTANT ENGINEER, Power Sales, at Sub-Area H.Q.

Candidates should have practical training and general electrical engineering experience in the utilisation of electricity in industry. Experience in changeover from d.c. to a.c., and street lighting is desirable, but not essential.

The salary will be in accordance with the National Joint Board Revised Schedule, Class "H", Grade 13, i.e. £458 to £467 to £476 per annum.

ASSISTANT, Commercial Development Section, at Sub-Area H.Q.

Candidates should have exeprience in some of the following: supervision of service centres; domestic and commercial load development; organisation of exhibitions and demonstrations; publicity, advertising and display; agricultural and horticultural applications.

The salary will be in accordance with Grade 3 of the National Joint Council (Administrative and Clerical Grades) for the Electricity Supply Industry Salary Grades, i.e. £450 by £20 to £510 per annum.

DEMONSTRATOR, Blackburn District.

Candidates must have a good education with training in domestic science. Preference will be given to applicants who hold the E.A.W. Diploma. If the diploma is not already held, the successful candidate will be expected to take suitable courses to obtain it. The person appointed will be required to give lectures and demonstrations on all types of domestic appliances and advise consumers in the choice of equipment.

The salary will be in accordance with Grade 1 of the National Joint Council (Administrative and Clerical Grades) for the Electricity Supply Industry Salary Grades, i.e. £310 by £20 to £390 per annum.

Applications stating age, training, qualifications and experience, present position and salary, and the appointment for which application is made, should be received by R. H. Harral, M.I.E.E., M.Inst.F., No. 5 Sub-Area Manager, The North Western Electricity Board, Jubilee Street, Blackburn, not later than Saturday, October 21, 1950. (G 377)

NORTH WESTERN ELECTRICITY BOARD

No. 5 Sub-Area

APPOINTMENT OF GENERAL ASSISTANT ENGINEER (AGRICULTURAL DEVELOPMENT)

APPLICATIONS are invited for the appointment of General Assistant Engineer (Agricultural Development) in the Sub-Area Consumers' Engineer's Department, No. 5 Sub-Area Headquarters, Blackburn.

Applicants should have experience in all applications of electricity to farming, horticulture and poultry farming, and be able to advise on plant and equipment for these requirements. Some theoretical knowledge of agriculture is desirable, and ability to give lectures would be an advantage.

Salary will be in accordance with the National Joint Board Revised Schedule, Class "H," Grade 13, i.e. £485-£467-£476 per annum.

Applications, stating age, qualifications and experience, present position and salary, should be received by R. H. Harral, M.I.E.E., M.Inst.F., No. 5 Sub-Area Manager, The North Western Electricity Board, Jubilee Street, Blackburn, not later than Saturday, October 21, 1950. (G 376)

A POSITION of permanency, with pension rights, on the switchgear drawing office staff of the English Electric Company at Stafford, is now available to SENIOR DRAUGHTSMEN with experience of station layout for outdoor switching stations. Experienced layout draughtsmen are asked to send particulars of their experience, quoting reference 151, to Central Personnel Services, English Electric Co. Ltd., 24-30 Gillingham Street, London S.W.1. (G 315)

APPLICATIONS are invited by the English Electric Co., Ltd., for ENGINEERS having wide experience in the preparation of comprehensive and specialised schemes of machine control. Applicants must be of Higher National Certificate standard and capable of preparing schemes in detail.—Apply, quoting Reference 806, to Central Personnel Services, English Electric Co., Ltd., 24-30 Gillingham Street, London S.W.1. (G 334)

URGENTLY REQUIRED

POWER STATION CHARGE ENGINEERS

by major oil company for service in the Middle East. Applicants must hold at least Higher National Certificate in Electrical Engineering and have had not less than three years' experience in the operation of large modern Steam Power Stations with thorough knowledge of the routine operation of water-tube boilers, turbo-alternators, E.H.T. switchgear and auxiliary plant. Present position in this country should be not less than Grade 8a, Class "H" or Grade 8, Class "G" on N.J.B. Scale. Age not over 35 years. Married accommodation available. Commencing salary not less than £900 per annum PLUS an allowance in the local currency which is liable to variation but which at the present time is equal to £1,400 per annum. Free passages out and home, free medical attention, kit allowance, good leave arrangements, excellent Pension Scheme. Write giving age, personal particulars and full details of qualifications and experience, quoting Dept. F.189, to

Box No. 2550 at 191 Gresham House, E.C.2

(E 284p)

AN interesting and progressive position exists for a qualified ELECTRICAL ENGINEER, in connection with the design and development of servo and electro magnetic equipment for aircraft.—Apply, giving age, details of experience and salary required to Mr. G. Orlott, Chief Designer, British Messier, Ltd., Cheltenham Road East, Gloucester. (G 233)

APPLICATIONS are invited for a number of vacancies for ELECTRICAL ENGINEERING SENIOR DRAUGHTSMEN for the installation of electrical equipment in large civil and military aircraft. Some knowledge of electronic equipment is desirable and possession of O.N.C. or H.N.C. (Elect.) preferable. The vacancies are for Cricklewood and Radlett (Herts.) drawing offices. Further vacancies exist at Cricklewood only for Junior Electrical Engineering Draughtsmen for detailing the above work. Applications from trainees wishing to take up a career in aircraft electrical installation work will be considered. The positions offer excellent opportunities for advancement to keen men. Write, stating age, and full details of experience and qualifications, to : Staff Officer, Handley Page, Ltd., Cricklewood, London N.W.2. (G 260)

APPLICATIONS are invited by the English Electric Co., Ltd., Stafford, from young ENGINEERS of graduate or Higher National Certificate standard, with experience in the preparation of control gear wiring diagrams, for training as control gear engineers on specialised schemes. Selected applicants will, where necessary, be given a short course of training and will receive full pay during this period. The positions are permanent and progressive and afford excellent opportunities.—Apply, quoting Reference 805, to Central Personnel Services, English Electric Co., Ltd., 24-30 Gillingham Street, London S.W.1. (G 335)

ASSISTANT ELECTRICAL DESIGNER, B.Sc., First or second-class honours in electrical engineering. Experience of industrial electronic technique; knowledge of electric traction desirable.—Applications: Personnel Manager, Electro-Hydraulics, Ltd., Warrington, Lancs. (G 326)

CABLE ENGINEER required to supervise 33 kV cable laying and jointing contract abroad for approximate period of 12 months. Apply, in writing, giving details of age and experience, to: Managing Director, Scottish Cables, Ltd., Renfrew, Scotland. (G 371)

CONTRACTS ENGINEER for London contractor specialising in excavating, cable laying and jointing. Duties to include estimating, preparation of technical specifications and supervision of contracts. Good technical background essential.—Reply, giving full particulars, stating experience, salary required and age, Box No. 1793, Electrical Times. (G 374)

CROMPTON PARKINSON, LTD., have a vacancy for an ESTIMATING ENGINEER in their London office. Applicants should have had engineering training and previous experience in engineering estimating, particularly in the field of small electric motors, is desirable.—Please send full details to Reference JHF/P, Crompton House, Aldwych, W.C.2. (G 356)

DESIGNER of Mains and Audio Transformers required. Experience of Commercial Design work necessary. Must be able to produce full manufacturing and test specifications. Interesting position. N.W. London area.—Write, stating experience, age and salaries earned, to Personnel Manager, Box No. 1771, Electrical Times. (G 306)

ELECTRICAL DESIGNER DRAUGHTSMEN required, experienced in industrial power distribution, sub-station layouts, and conduit lighting and power schemes. Several men required. Good working conditions; pension scheme operating.—Apply by letter, stating experience and salary required, to The Chief Draughtsman, The Lummus Co., Ltd., Imperial House, 80 Regent Street, London W.1. (G 355)

ELECTRICAL DEVELOPMENT ENGINEER required by major British oil company for service in the Middle East in connection with industrial layouts and distribution schemes. Applicants must be graduates of the Institution of Electrical Engineers or equivalent, and practical electrical engineering experience on construction duties in steel works, collieries, or similar plant is desirable. Maximum age limit, 35. Attractive salary, plus generous allowance in local currency, free passages out and home, kit allowance, free medical attention, good leave arrangements, pension scheme.—Write, stating personal particulars and full details of qualifications and experience, quoting Department F.206, to Box No. 2949, at 191 Gresham House, E.C.2. (G 92)

ELECTRICAL DRAUGHTSMAN required by major oil company for service in the Middle East. Must have served five years electrical engineering apprenticeship, and have had five years D.O. experience in connection with electrical layouts of large industrial plants with underground cable networks. Should possess Higher National Certificate. Graduate or associate membership of a corporate engineering body desirable but not essential. Maximum age limit 35 years. Attractive salary plus generous allowance in local currency. Free passages out and home, free medical attention, kit allowance, good leave arrangements. Pension scheme.—Write, giving personal particulars and details of qualifications and experience, quoting Dept. F.192, to Box No. 2809, at 191 Gresham House, Old Broad Street, E.C.2. Applicants without above requirements will not be considered.(F 322)

ELECTRICAL ENGINEER, having experience in e.h.t. and l.t. distribution layouts, required for works engineer's department of large industrial concern on outskirts of Birmingham. Higher National Certificate desirable. Salary according to qualifications and experience.—Box No. 1789, Electrical Times. (G 352)

ELECTRICAL ENGINEER (OR MANAGER) required for iron and steel works.—Applications, giving age, experience, etc., and including photograph, should be submitted, together with salary required, to Box No. 1737, Electrical Times. (G 205)

ELECTRICAL ENGINEERS required by major British oil company for several months' training in U.K. in power-station work for eventual service in the Middle East. Minimum qualifications: Higher National Certificate in Electrical Engineering, with one year's industrial experience. A salary is paid while in U.K., together with contribution to cost of living if away from home. Overseas posts offered to successful trainees will carry attractive salary plus a generous allowance in the local currency free passages out and home, free medical attention, good leave arrangements, pension scheme.—Write, giving personal particulars and details of qualifications and career to date, quoting Department F.198, to Box. No. 2946, at 191 Gresham House, E.C.2. (G 93)

ELECTRICAL ENGINEER required in London area. Able to introduce business and estimate, etc.—Write full particulars of experience and salary required, to Box No. 1761, Electrical Times. (G 266)

ELECTRICAL INSPECTOR for Mains and Audio Transformer Test Department. Previous similar experience essential. N.W. London.—Write, with full details of age and salaries earned, to Personnel Manager, Box No. 1773, Electrical Times. (G 307)

EXPERIENCED ESTIMATING ENGINEERS, capable of preparing tenders for electrical rotating plant and attendant apparatus.—Applications, stating age and salary expected, to Personnel Manager, Lancashire Dynamo & Crypto, Ltd., Trafford Park. (G 302)

FERRANTI, LTD. have vacancies in their meter Department for GRADUATE ENGINEERS with industrial experience in the design of electricity meters. Liberal salary, with pension benefits.—Application forms from Staff Manager, Ferranti Ltd., Hollinwood, Lancs. Please quote reference M.E. (G 327)

LARGE old-established and well-known Scottish manufacturing firm require TRANSFORMER SALES ENGINEER, initially for position inside for the preparation of tenders for all types of transformers, large and small, for the home and export markets, and ultimately for appointment to the outside sales staff in England. Good technical and commercial transformer engineering experience is essential. Connection with power supply authorities, consultants, etc., a recommendation. State age, experience, and present salary.—Box No. 1757, Electrical Times. (G 252)

FOREMAN CABLE JOINTER required. Must have wide experience of 33 kV and lower voltage jointing and be capable of supervising jointers on contract work and under training.—Apply in writing, stating age, experience, and salary required, to Personnel Manager, Scottish Cables, Ltd., Renfrew, Scotland. (G 354)

MONSANTO CHEMICALS, LTD., require an ELECTRICAL DESIGNER DRAUGHTSMAN for the Engineering Department in London. Applicants should have a knowledge of industrial instruments for designing and detailing electrical circuits for control instruments, remote control motor relays, automatic safety devices, etc.—Apply in writing, giving full details of age, education, training and experience, to Chief Personnel Officer, Monsanto Chemicals, Ltd., 8 Waterloo Place, London S.W.1. (G 331)

REPRESENTATIVE required by London electrical wholesalers. Connection with contractors and industrial users in South London area essential—Apply, in writing, to Box No. 1791, Electrical Times. (G 373)

REPRESENTATIVES SALESMEN wanted for Neon Sign Makers, Works, Manchester. Areas to be covered, 200 miles of works. Experience preferred, but salesmen, etc., with electrical knowledge, especially of signs or lighting schemes, welcomed. Car an advantage. State wages and or commission, or if prepared to operate as an addition to present lines. Excellent prospects and good returns with rapidly expanding go-ahead concern. Full details to: J. E. Taylor, Grange Sign Works, Lostock Road, Davyhulme, Manchester. All replies acknowledged. Tel. No. : Urmston 4469. (G 320)

REQUIRED for New Zealand. SALES ENGINEER, take charge of department handling electrical accessories, motors, switchgear, etc. Must have had technical and sales experience, first-class qualifications. Salary, commission and passage. Age not exceeding 32 years.—Apply in writing, Nathan & Allen, Ltd., 131 Victoria Street, London S.W.1. (G 282)

SENIOR AND JUNIOR ELECTRICAL DESIGNERS, experienced in all classes of a.c. and d.c. dynamo electric machines from 5 to 5,000 h.p./kW. Five-day week. Superannuation scheme in operation.—Applications, stating age, experience, and salary expected, to Personnel Manager, Lancashire Dynamo & Crypto, Ltd., Trafford Park. (G 303)

SENIOR DESIGNER, with industrial and/or traction motor control design experience, wanted by progressive manufacturer to engineer new control gear development. Salary £700 per annum.—Full particulars to Box No. 1753, Electrical Times. (G 250)

SENIOR ELECTRICAL DRAUGHTSMEN required by established British firm with American affiliation. Experience of power distribution and lighting installations, as applied to the oil refinery and chemical industry, essential. Qualifications to H.N.C. standard. Substantial salaries will be paid to suitable applicants.—Write, stating age, qualifications and experience, Foster Wheeler, Ltd., 3 Ixworth Place, London S.W.3. (G 212)

SENIOR METHODS AND PLANNING ENGINEER for manufacturers of electrical switches, thermostats and other controlling devices. West London factory. Only first-class applicants will be considered. State salary required.—Box No. 1777, Electrical Times. (G 309)

STRUCTURAL DESIGNERS AND DESIGNER, DRAUGHTSMEN with experience in light steel structures required for work in London office in connection with radio masts and towers.—Apply, stating age, qualifications, experience and salary required to the Staff Officer, British Insulated Callender's Construction Company, Limited, 21 Bloomsbury Street, London, W.C.1. (G 375)

TECHNICAL ASSISTANT required in Electrical Department of large works in the north-west.—Applications, giving age, details of education, experience, positions held (with dates), and including photograph, should be submitted, together with salary required, to Box No. 1733, Electrical Times. (G 190)

UGANDA.—ASSISTANT ENGINEER, with sound technical training, to assist in investigation of electricity utilisation schemes and preparation of reports, including make-up of plans and drawings. Single man, 30-35, preferred. Three-year contract. Salary approximately £800 per annum, together with housing, outfit, free passage, and leave on full salary.—Apply by letter, stating whether married or single, and full particulars of qualifications and experience, to Box No. 1787, Electrical Times. (G 330)

WANTED, ASSISTANT ELECTRICAL ENGINEER for British Guiana, capable of taking charge small repair shop, including armature and stator winding, as well as general maintenance and repairs. Single man preferred. Salary £650, rising £700 during first three years' contract. Three months' leave. Free passages. Superannuation scheme.—Write, fullest particulars, Box No. 1783, Electrical Times. (G 319)

APPOINTMENTS WANTED

BUYER, M.P.O.A., aged 28, providing positive and economic results, exp. foundry, sheet metal, vitreous enamel and light elect. eng., seeks progressive appointment.—Box No. 1781, Electrical Times. (G 318)

ELECTRICAL DESIGNER DRAUGHTSMAN (33) seeks new appointment. National Certificate, excellent knowledge of electrical engineering, specialising in super tension, impregnated pressure cable on board and in the field.—Box No. 1711, Electrical Times. (G 160)

WORK WANTED

A.C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed.—Edgware 8631 (4 lines), Service Electric Co., Ltd., Stanmore, Middx. (D 324)

ARMATURE SERVICE CO., LTD., Haddington Street, Hove (Tel. 32996), electrical engineers and winding specialists. Distance no object. (F 739)

CAPACITY available for the manufacture on mass production lines of electrical appliances, at present manufacturing low-priced electric fire and hot cupboards. —Box No. 1775, Electrical Times. (G 308)

CASTINGS, Fisher Foundries, Ltd., Greet Birmingham, have capacity for brass, gun metal and soft grey iron machine moulded repetition castings weighing 1 30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts Tel.: B'ham, Victoria 0197. (F 27)

GUARANTEED, high quality Stator and Armature Re-winds, F.H.P. motors, portable tools, etc. Contract rates available.—Sarum Electric, Ltd., Brown Street, Salisbury. Tel. 4245. (G 52)

STOP WATCHES REPAIRED at a reasonable price. 12 months' guarantee.—J. W. Hughes, Clockwork Engineers, 3 St. Thomas' Street, London Bridge, S.E.1. Tel.: Hop. 2759. (G 164)

WANTED

A.C./D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Phone: Chiswick 5105. (A 20)

SCRAP ACCUMULATOR PLATES and Sediment wanted, any quantities. Also Storage Batteries purchased and dismantled.—Phone or write Elton Levy (Co., Ltd., St. Ermin's (West Side), Caxton Street, London S.W. Phone: WHitehall 9621 2 3. (A 3)

WANTED, DIESEL GENERATING SET, 27 or 30 kVA, 400-440 V, 3-phase, complete with switch panel.—North Electrical and Refrigeration Co., Ltd., 177 High Street, Northfleet, Kent. (G 301)

WANTED.—D.C. and a.c. ball-bearing MOTORS.—Full details to Britannia Manufacturing Co., Ltd., 22 26 Britannia Walk, London N.1. (A 13)

WANTED, ROTARY CONVERTERS, any size.—Universal, 221 City Road, London E.C.1. (A 16)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady St., Bethnal Green, E.1. (A 1)

WANTED.—Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock Water-tube Boilers. Best prices paid. Prepared to purchase Babcock and Wilcox Water-tube Boilers for dismantling. —Apply, giving full details to Midland Iron and Hardware Co., Cradley Heath. (A 5)

WANTED, infinitely variable speed MOTOR, 3-10 h.p., 200 V, 3-phase.—Write, Creators, Ltd., Silmay Works, Kings Road, New Haw, Weybridge, Surrey. (G 325)

AGENCIES

MANUFACTURERS' AGENTS ASSOCIATION, INC. (F.T.), 8 Bream's Buildings, London W.C.2, supplies free lists of Agents to Manufacturers seeking representation in important industrial centres. Membership available to established agents only. Particulars supplied. (A 7)

BUSINESS OPPORTUNITIES

WIRELESS.—Managing Interest available in a company with small factory just commencing production of a new, successful, and important requisite essential to electronics for various purposes. Would suit independent technical man interested in sales and research. Details to principals only.—Write, Box No. 4533, Walter Skinner, Ltd., 20 Copthall Avenue, London E.C.2. (G 332)

FOR SALE

DOMESTIC APPLIANCES

COMMERCIAL IRONS for all purposes.—Donaldsons Wireless Electric Irons, 31 Sloan Street, Leith. (A 163)

IMMERSION HEATERS. Grubb 4 kW. No purchase tax. All lengths, 16 in. to 36 in. Standard voltages. Provision for intermediate loadings. Fully guaranteed and immediate delivery. Write for illustrated brochure, latest lists and trade terms to distributors.—John Owner and Co., Ltd., Springfield Road, Birmingham 13. Tel.: Spr. 2939. (C 392)

2 KW 200/300 V. IMMERSION HEATERS, c/w, a.c./d.c. Thermostats and Flanges, 55/-, carriage paid. Cash with order.—Green Bros., Manor Road, Brackley, Northants. (G 278)

ENGINEERING PLANT & MATERIALS

ALUMINIUM ALLOY, new polished flat sheets, size 6 ft by 3 ft by 24 gauge, £9 15s. per dozen. Corrugated Sheets, 6 ft by 3 ft by 24 gauge, £9 9s. per dozen. All prices carriage paid. Delivery ex-stock.—Sawyers Manufacturing Company Limited, Bures, Suffolk. Tel.: Bures 351/2. (F 552)

CRANE, 2-ton, Telpher Hoist, cage controlled, 400 V, 3-phase, 50 c/s; guaranteed as new. Price £250 at works.—Viewed at F. A. Holt, Ltd., The Green, Darlaston. Tel.: Darlaston 531. (G 239)

LADDERS (wooden and aluminium, all types), Trestles, Steps, Handcarts, etc., from Ramsay and Sons (Forfar) Ltd., Forfar (Tel. 172). (C 603)

WELDING PLANT. Several Motor Generator Arc Welders, single, double and multi-operator up to 600 amps, input 400/440 V, 3-phase, 50 cycles. Also several single and double operator oil cooled transformer welders. All modern units by well-known makers. Attractive prices.—Full details write: Thos. W. Ward Ltd., Albion Works, Sheffield. (E 111)

GENERATING PLANT

ALTERNATORS from stock, 400/440 V, 3-phase, 50 c/s, with Exciters and switchboards. 80 kVA "GEC" 1,000 r.p.m. 40 kW "ECC," 750 r.p.m. 28 kVA "Crompark," 1,500 r.p.m.—Full details, write: Thos. W. Ward Ltd., Albion Works, Sheffield. Phone 26311 (ex 347). (E 109)

DIESEL ALTERNATOR SETS in stock, standard voltages, single and three phase. Details post free on request.—Thos. W. Ward, Ltd., Albion Works, Sheffield Tel. 26311 (ex 347). (E 108)

LISTER DIESEL GENERATOR set 15-kW., 400 V, 3-ph., 50c/s, mounted on steel base, complete with control panel—can be seen working under load. £575, or near offer. —Safety Tread Ltd., Dace Road, London E.3. Amherst 4407. (G 334)

MOBILE Dorman Diesel Generator or Welder, 15 kVA, suitable 110-V battery. In excellent condition. Reason for disposal, mains connected. Price for quick sale, £300.—Wicksteeds, Royston, Herts. Tel.: Royston 3154. (G 322)

MOTOR GENERATING SETS. Built to customers' requirements of new and used plant. Many in stock at Wembley, inspection invited. Please send us your inquiries. We can help you to save time. Over a THOUSAND MACHINES ALWAYS IN STOCK.—Dynamo and Motor Repairs Ltd., Wembley Park, Middlesex. Telephone: Wembley 3121 (4 lines). Also at Phoenix Works, Belgrave Terrace, Soho Road, Birmingham. Telephone: Northern 0898. (A 2)

THE Electroplant Co., Wembley, for any type of special duty electrical plant. Specialities: CONVERTORS, GENERATING SETS, ELECTRICAL TEST EQUIPMENT. Ask for production range. (E 445

1 ALTERNATOR, G.E.C. 6,500 kW 0·9 power factor 6·6 kV 3-phase 50 c/s, at 500 r.p.m. Two-bearing Alternator, complete with exciter and bed plate together with panel.—Apply: C. J. Rice, 137 Mayplace Road West, Bexleyheath, Kent. Tel.: Bex. 3282. (F 494)

4 kVA GENERATOR SET, 230 V a.c., 4-cylinder Coventry Climax petrol engine, alternator; switch gear and panel; complete set in very good condition.—Particulars from Daking and Wright, Estate Offices, Broadway, Peterborough. (G 353)

100-kVA MODERN DIESEL ALTERNATOR SET, comp. Vert. 6-cyl. Diesel engine direct coupled to alternator on baseplate, 400/230 V, 3-phase, 50 cycles, 4 wire. Details on request.—Thos. W. Ward, Ltd., Albion Works, Sheffield. Tel. 26311 (ex 347). (E 112)

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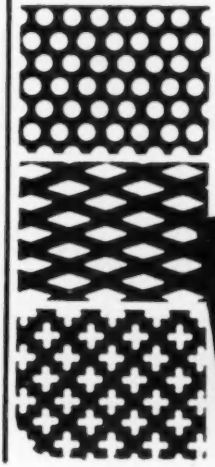

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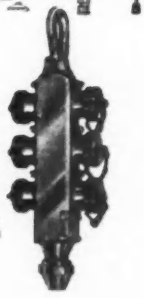
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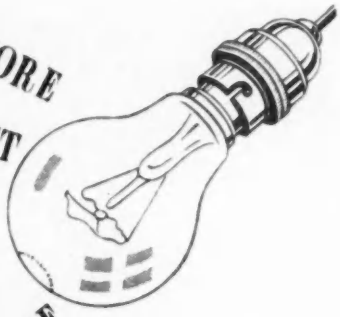

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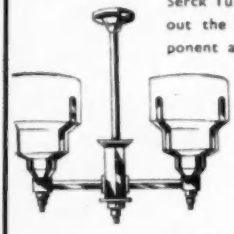

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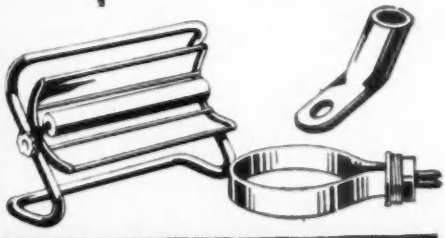

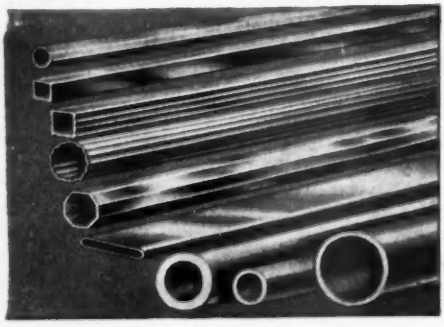

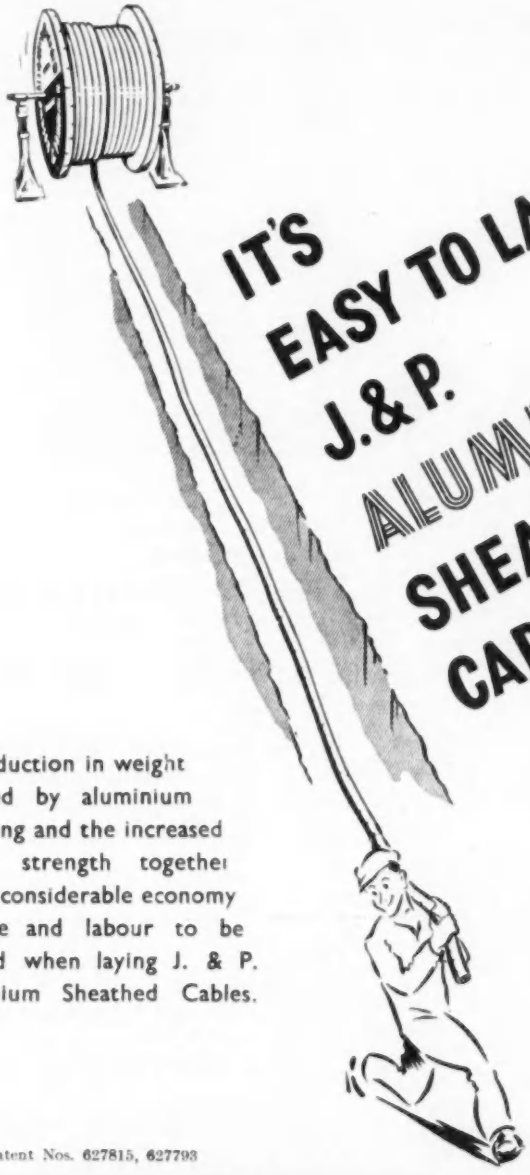

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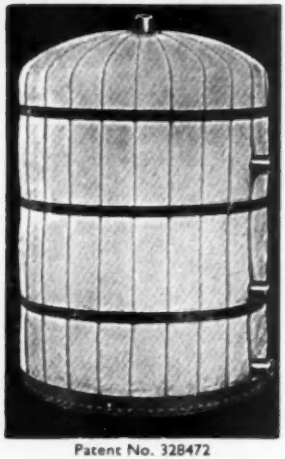

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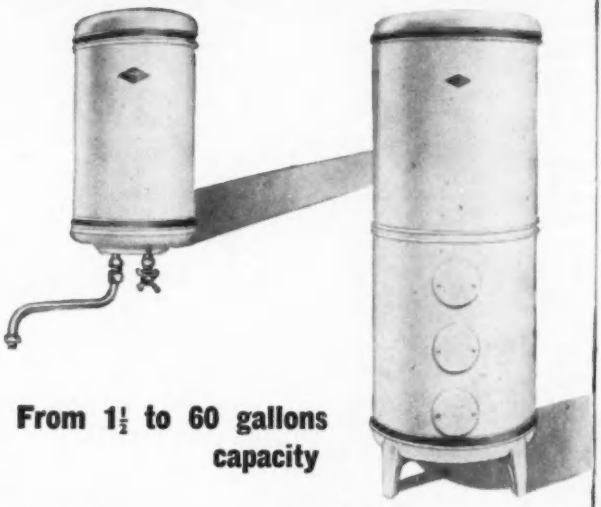

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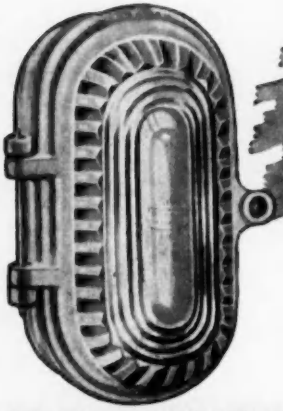

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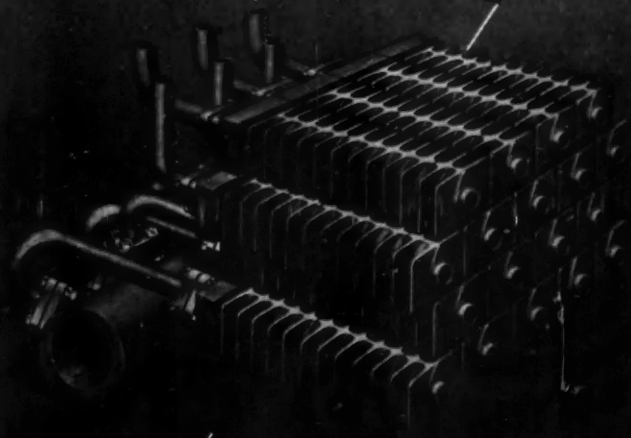

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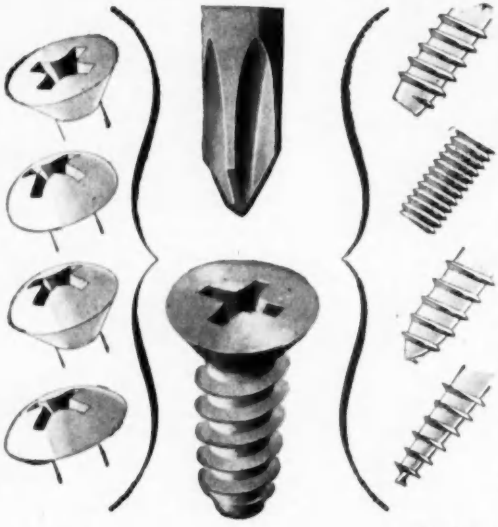

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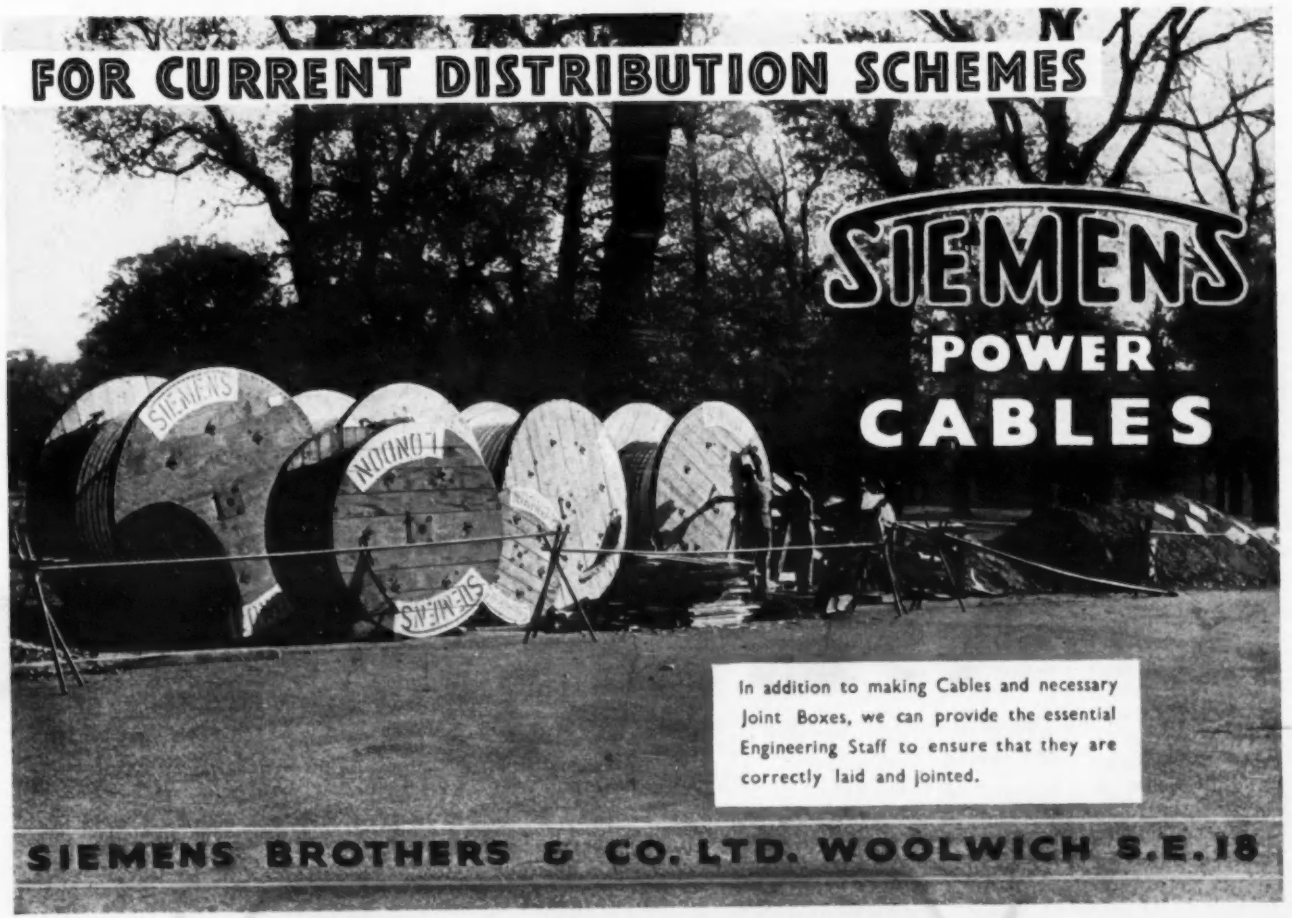
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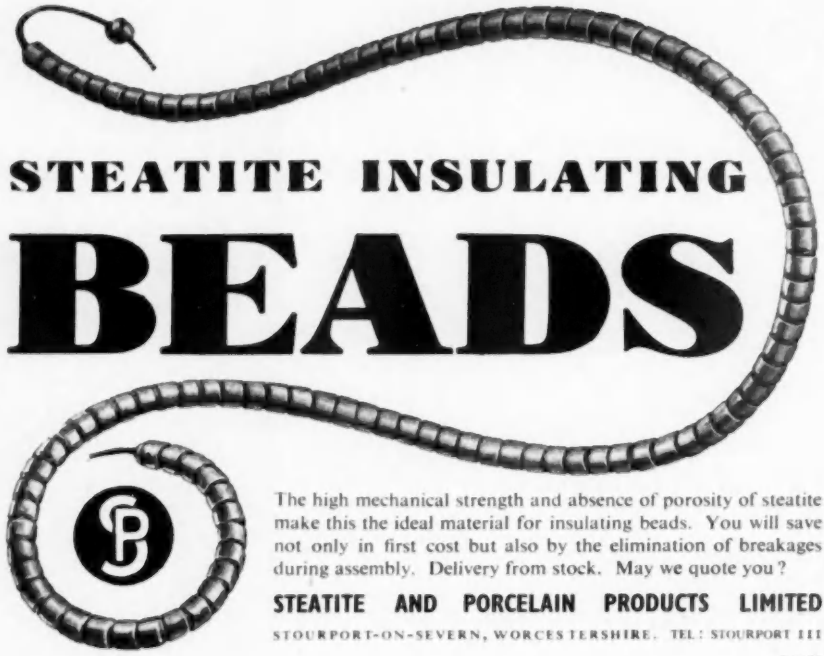

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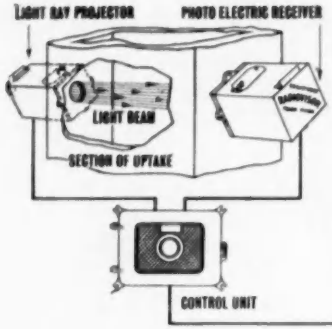

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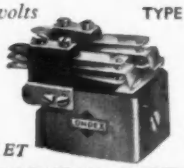

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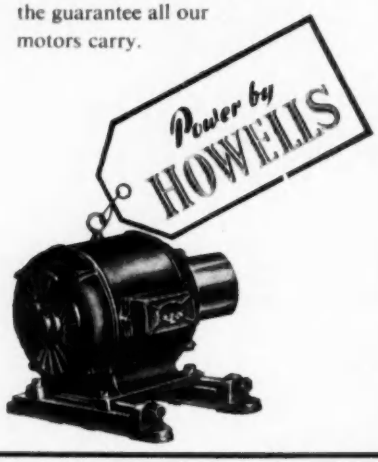

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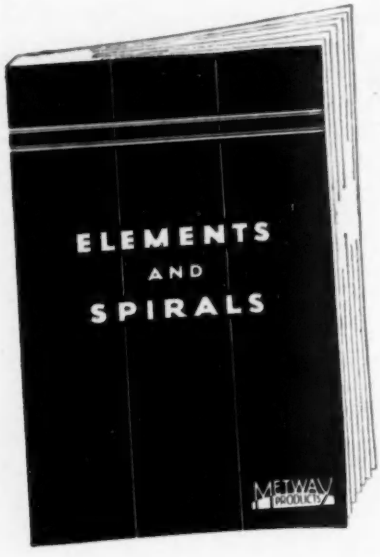

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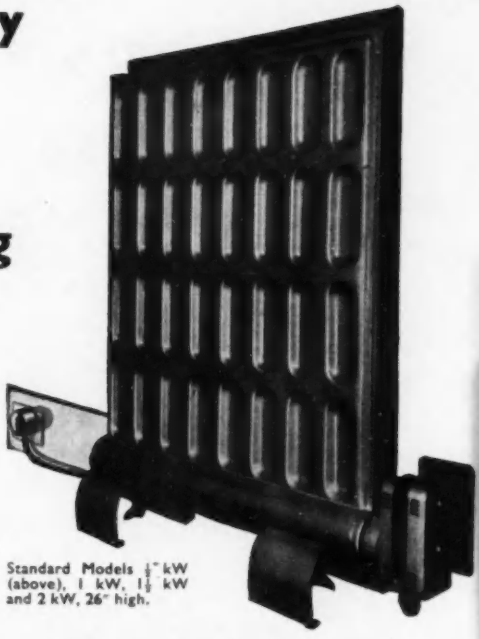
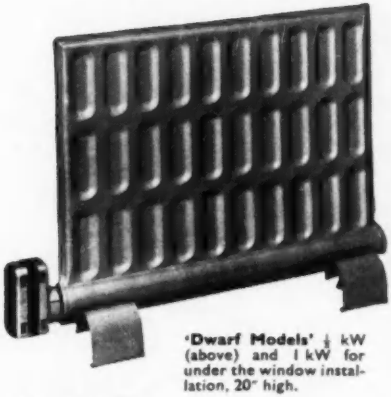


Standard Models ½ kW (above), 1 kW, 1½ kW and 2 kW, 26" high.



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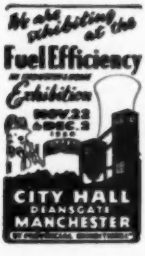

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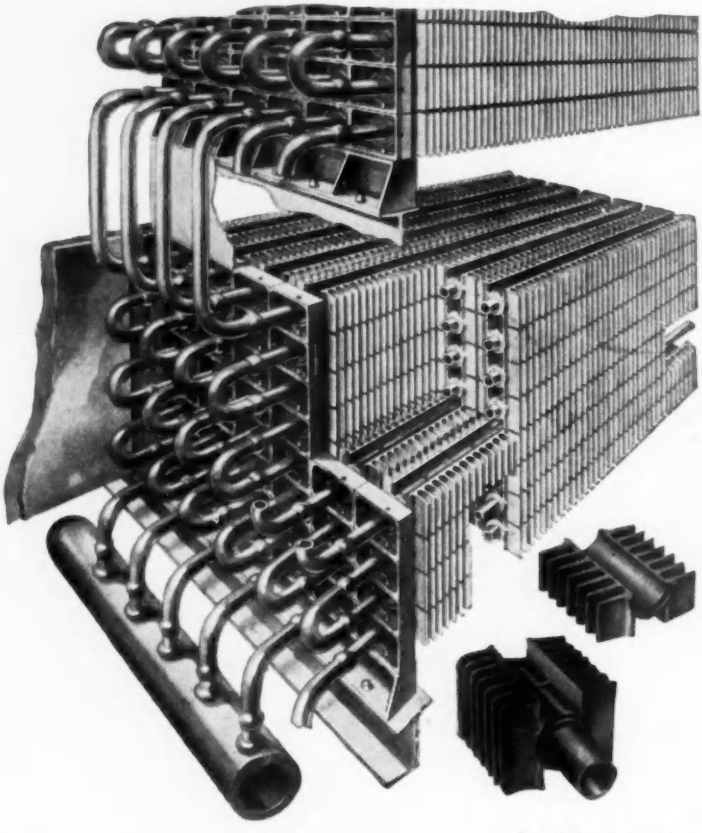

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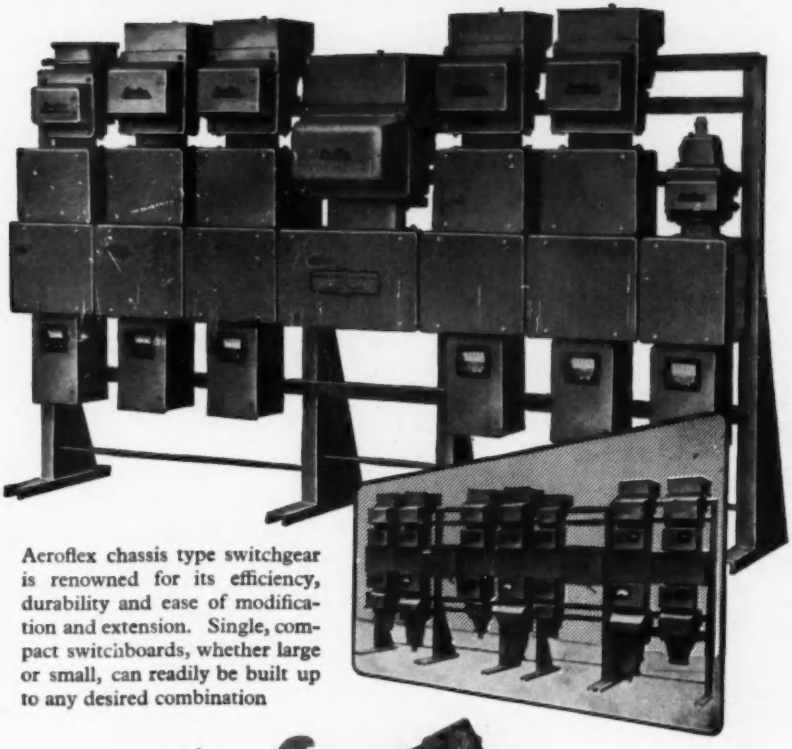

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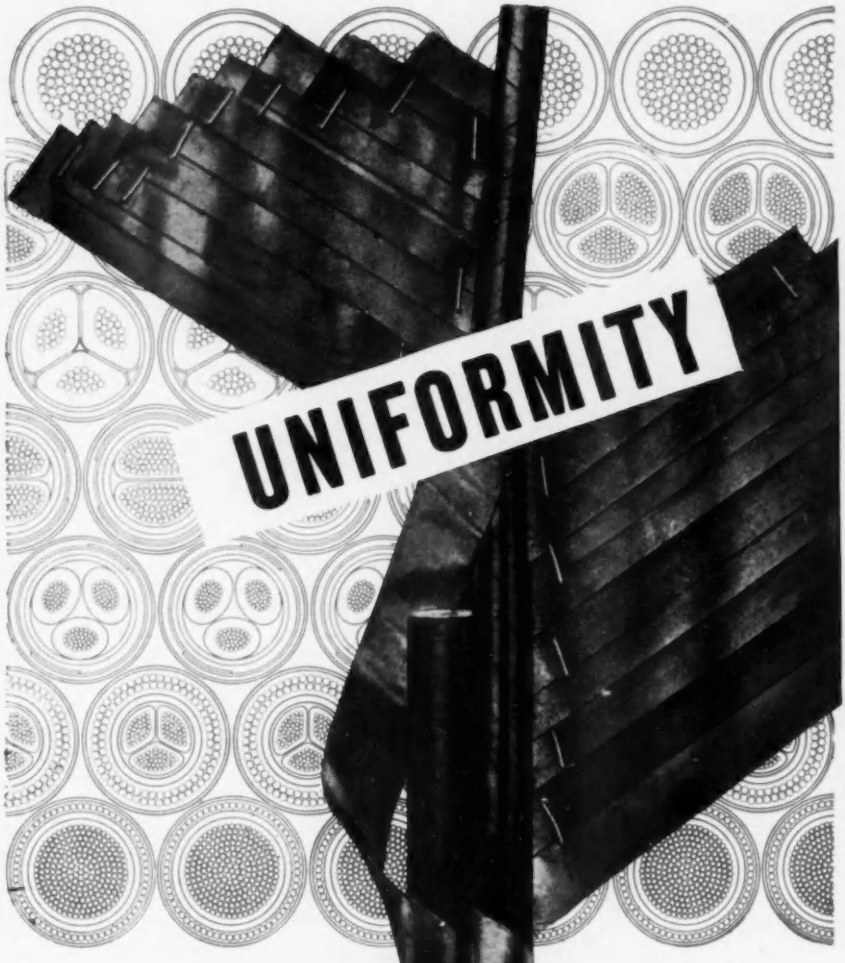

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